Railway Mechanical Engineer

October 1943

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With which is incorporated RAILWAY ELECTRICAL ENGINEER

Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 117, No 10.

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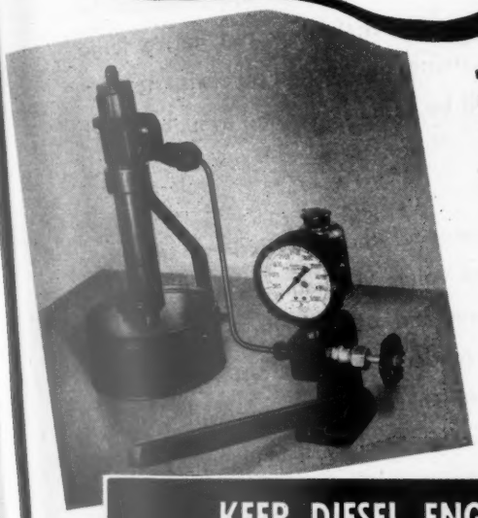

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THE EDITOR'S DESK

LOOKING AHEAD

Transportation, industrial and commercial interests are all looking forward to the close of the war and our return to more normal conditions. Authorities, generally, seem to agree that the post-war national income will be in the neighborhood of one hundred billion dollars. In 1941, when it was ninety-five billion, the railways earned one billion dollars net operating income and placed heavy orders for cars and locomotives. Because of government restrictions they were unable to get delivery on all of this equipment and they have had comparatively little since. One of the best comments on post-war railway supply business possibilities was recently made by Samuel O. Dunn, chairman of the Simmons-Boardman Publishing Corporation and editor of the Railway Age. Speaking before the Advertising Club of St. Louis he said:

"If the annual national income is as much as one hundred billion dollars, there are three good reasons why the orders placed by the railways in the early post-war years probably will largely exceed those they placed in 1941.

"*First*, because of government restrictions on the equipment and materials they can get, a large part of the earnings they would otherwise now be spending will be carried over and available after the war.

"*Second*, because of these restrictions, and the unprecedented volume of traffic being handled, their equipment and other facilities are being worn out and rendered obsolete faster than ever before. They will have more money with which to buy, and more need to buy, than in many years.

"*Third*, there began before and has been occurring during the war, great progress in the development of improved materials. By renewing and increasing their buying of these materials, the railways can effect great improvements in their passenger and freight equipment, in their tracks and other structures, and in their service."

Roy V. Wright

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(Name Registered, U. S. Patent Office)
With which is incorporated the RAILWAY ELECTRICAL ENGINEER.

Founded in 1832 as the American Rail-Road Journal

OCTOBER, 1943

Volume 117 — *No. 10*

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York 7, and 105 West Adams street, Chicago 3. Branch offices: Terminal Tower, Cleveland 13; 1081 National Press bldg., Washington 4, D. C.; 1038 Henry bldg., Seattle 1, Wash.; 300 Montgomery street, Room 805-806, San Francisco 4, Calif.; 560 W. Sixth street, Los Angeles 14, Calif.

Subscriptions, payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York 7.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. PRINTED IN U. S. A.

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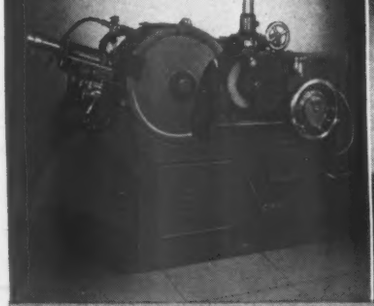
For more information on these machines send for our General Catalog M-995-1 or see our insert in Sweet's Catalog under Mechanical Industries File.



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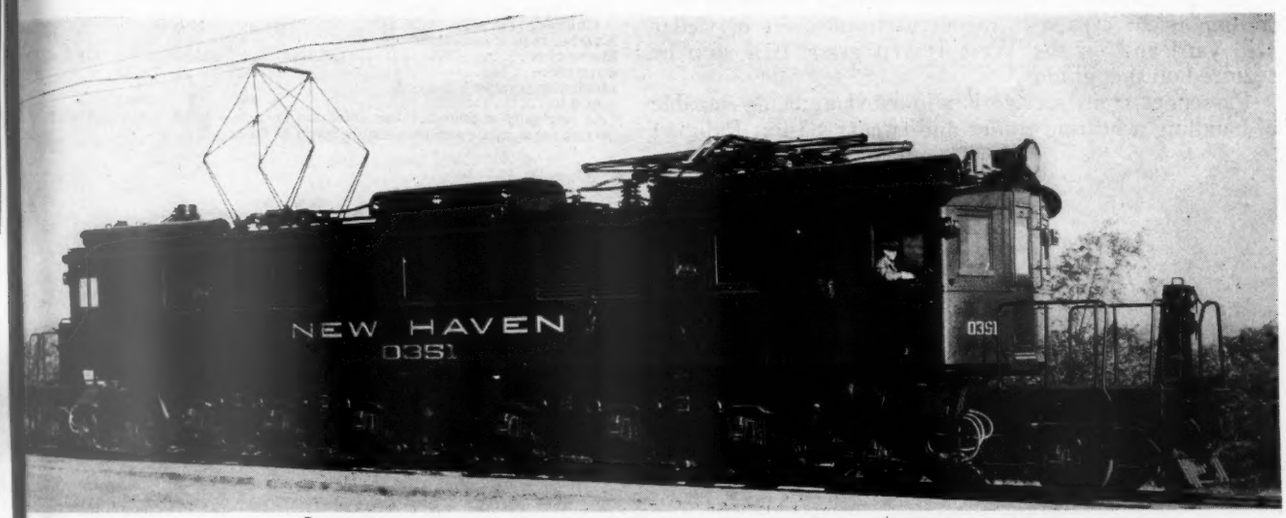
ew Haven Receives Five More

A. C. Electric Locomotives*



ig. 1—One of the series 0351 passenger locomotives placed in service in 1931

By T. F. Perkinson† and Robert Walsh†

Comparison of three types shows trend of development during the past ten years

THE recent delivery of five 11,000 volt a. c. electric reight locomotives, built by General Electric for the New ork, New Haven & Hartford, marks the latest step in 12-year program of securing fast, high-powered motive ower for the railroad's electrified territory. The proto-ype of the latest locomotives is the 2-C + C-2 unit (Fig.), ten of which were built at the Erie Works of the eneral Electric Company for passenger service in 1931. hese units, equipped for 11,000-volt a. c. and 660-volt . c. operation, were followed six years later by six treamlined units (Fig. 2), also intended for passenger-rain service and arranged for a. c.-d. c. operation.

Within the past year the railroad has acquired ten arge a. c. freight locomotives, five of which were fur-ished by General Electric. One of these is shown in ig. 3. Table I compares the salient characteristics of he three sizes of General Electric locomotives and indi-ates clearly the trend to heavier axle loadings and greater orsepowers incorporated in single cab units.

The top speed-tractive force characteristics and the orresponding wheel horsepower characteristics of the hree classes of motive power are compared in Fig. 4.

The latest units are similar in appearance to those fur-nished in 1938—indeed, the similarity is so striking that from a distance one class of locomotive may be very readily mistaken for the other. The same treatment of streamlining and decorative finishing has been employed on both classes of locomotives.

The new locomotives are intended primarily for freight service, but may be employed with heating trailers in passenger service in the a. c. territory. Should traffic conditions warrant, the locomotives at some future date may be re-geared for a higher top-speed and train-heating equipment added. Removable ballast has been supplied initially and occupies the space that will be required for oil-and-water tanks and boilers in train-heating

* Five locomotives of the same type supplied by the Westinghouse Electric & Manufacturing Company were described in the October, 1942 issue of *Railway Mechanical Engineer*. This article compares the three most recent types of New Haven electric locomotives and supplies supplementary information.

† Transportation division, General Electric Company, Erie, Pa.

service. The running-gear has been designed to permit of operating a top speed of 90 m. p. h. with re-geared traction motors.

The heavier axle loading—60,000 lb. per driving axle initially with provision for increasing this to 62,000 lb.—is permitted because the new locomotives, designed for 11,000 volt a. c. operation only, will not be operated in the 660-volt d. c. territory which includes the New York Central's Park Avenue viaduct with its rigid bridge-loading restrictions.

The New Haven's specifications covering the 0155 class stipulate the handling of 125-car freight trains of 5,000 tons (non-adjusted) between Bay Ridge, N. Y., and Cedar Hill yard in New Haven, eastbound, with helper assistance out of Bay Ridge yards, on the Hell Gate Bridge approach and East New York grades, if train operations require a stop on these grades. Westbound performance requires the haulage of 3,000 tons trailing in 75 cars with helper assistance out of Cedar Hill yard and on the West Haven grade if a stop be required on this grade.

Passenger train service is stipulated as being capable of handling a heating trailer and twenty 85-ton Pullman cars between the Pennsylvania Station, in New York City, and New Haven, Conn. (a run of 76 miles) on a 97-minute schedule with two 2-minute intermediate stops and observing all slow-down and speed restrictions. The class 0351 and 0361 units were designed to handle

Table I—Principal Characteristics of the New Haven's Three Latest Types of Electric Locomotives

	1931	1938	19
Year built	1931	1938	19
Number of locomotives	10	6	
Road numbers	0351–0360	0361–0366	0155–01
Service	Passenger	Passenger	Freig
Wheel arrangement	2–C+C–2	2–C+C–2	2–C+C–
Weights—total, lb.	402,000	433,200	494,0
On drivers	271,800	272,400	360,0
Per driving axle	45,300	45,400	60,0
On guiding trucks	130,200	160,800	134,0
Wheel base—total, ft.—in.	66–0	66–0	69-
Driving	37–4	37–4	37-
Rigid	13–8	13–8	13-
Length, over couplers, ft.—in.	77–0	77–0	80-
Heights, pantograph, locked down, ft.—in.	14–6	14–10	15-
Wheel diameter, driving in.	56	56	
Guiding	36	36	
Number twin armature motors	6	6	
Motor type	GEA-621-A-1	GEA-622-A-1	GEA-627-N
Gear ratio	81/20*	78/23	89/
Maximum permissible speed, m.p.h.	70	93	

* As originally supplied these units are currently being equipped with 79/2 gearing for a maximum permissible speed of 80 m.p.h.

Fig. 2—A series 0361 passenger locomotive delivered in 1938

Fig. 3—One of the ten freight locomotives placed in service during the past year

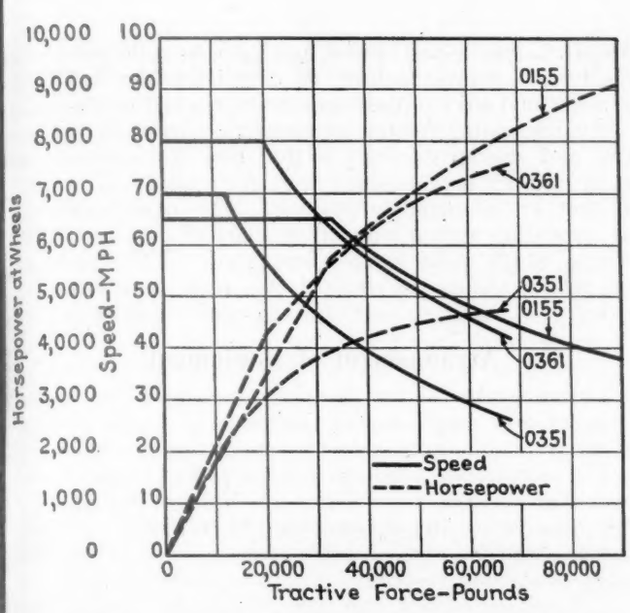


Fig. 4—Comparative characteristics of the three locomotives illustrated. See table for dimensions and ratings

in express service but fifteen 80-ton Pullman cars, the 0361 unit handling this train on a somewhat faster schedule than that obtainable with the 0351 units because of the superior horsepower at speed of the 0361 locomotives.

Tests, on both passenger and freight services, have demonstrated the ability of the 0155 units to meet the specification requirements without difficulty and with leeway ample to insure reliable freight and passenger-train scheduling.

Mechanical Equipment

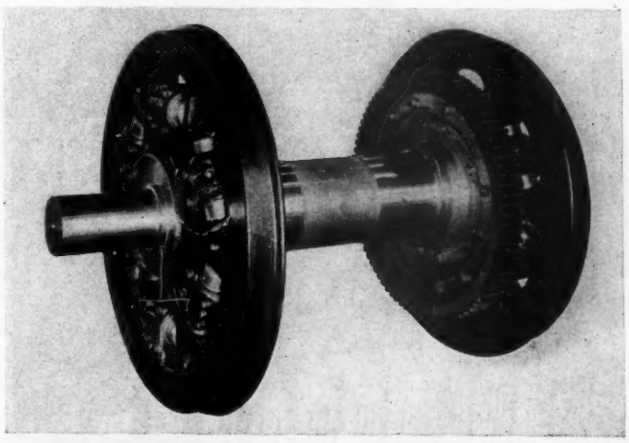
The running gear arrangement is the 2-C + C-2 type which has proved so successful in modern high-speed electric locomotive operation. It consists of two three-axle driving trucks, connected by an articulated joint, and two two-axle guiding trucks. The cab is supported on this arrangement at two center plates, 46 ft. 4 in. apart, and on four spring loading pads which are fitted with shims to permit an adjustment of the weight distribution between the driving and guiding trucks.

It may be found desirable to increase the weight slightly on the guiding trucks if the traction motors are ever re-geared for the maximum speed of the locomotive. This will increase the lateral restraint in the guiding truck swing bolster. In terms of percentage of the weight on the guiding truck, the initial lateral restraint is 27½ per cent, increasing to 32½ per cent with a bolster displacement of 1½ in., after which the restraint decreases gradually to 17 per cent.

In order to insure good riding qualities at the present maximum speed of 65 m.p.h., as well as at any future higher speeds, a guiding truck stabilizer is provided to restrain rotational movements of the guiding truck and a lateral restraint device is provided between the cab and one of the truck frames. Both of these devices are of design similar to those on the 0361 class of locomotive.

The truck frame for each of the guiding trucks and main driving trucks is an integral steel casting. The draft gear is enclosed in an extension of the main truck frame. All buffing shocks are transmitted along the main truck frames and through the articulated joint. In order to allow the locomotive to negotiate curves, one of the center plates is made to slide longitudinally on the truck frame.

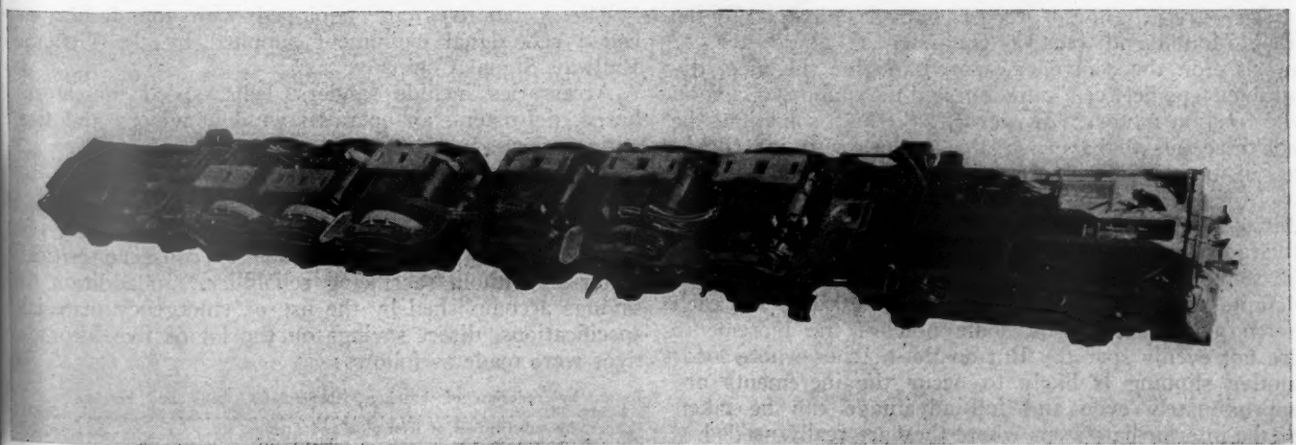
The equalization system is such that each main truck frame is supported on the equivalent of a three-point



Wheel and axle assembly with quill drive and gear

support; the guiding truck center plate is one support, the other two are through the side equalizer base and springs on the main truck frame.

Welding has been used extensively in the fabrication of the cab and cab underframe. The design is similar to that of the 0361 class locomotive in that the contour and details of the cab have been duplicated as closely as



Running gear with driving motors assembled in place

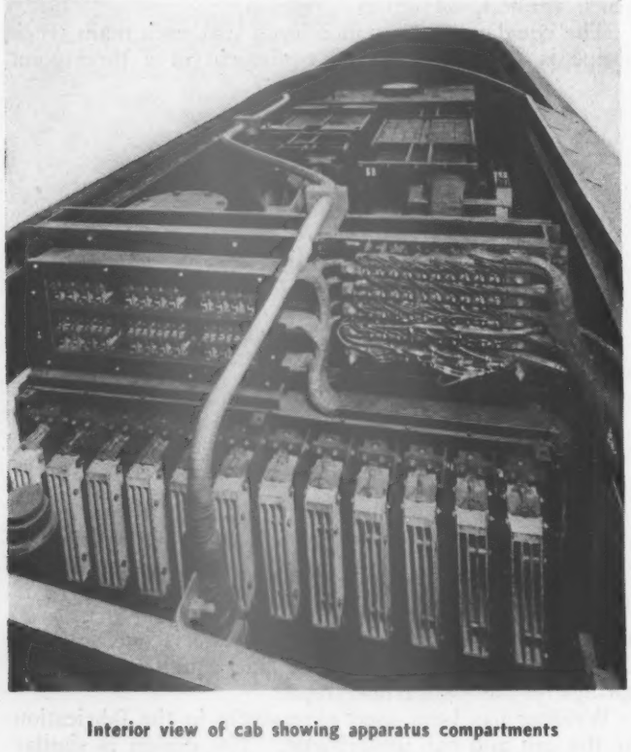
possible. And also, as on the 0361 class of locomotive, an outside truss is employed to strengthen the underframe, thus allowing a maximum amount of space for the equipment.

Electric Equipment

As these locomotives will operate only on the a. c. zone, the electrical equipment is simplified considerably.

There are six GEA-627-N-1 twin-armature, single-phase a. c. motors with commutating and compensating field windings. Each twin motor is capable of exerting 810 hp. continuously. The torque is transmitted to the driving axles through single solid gears mounted on hollow quills and double-end, flexible spring drives, as on the 0361 class.

To reduce the fire hazard to a minimum, Pyranol is used as the cooling medium in the forced-circulation, forced-air-cooled transformer. Taps are taken off the



Interior view of cab showing apparatus compartments

low voltage side of the transformer for voltage control of the traction motors and the operation of the auxiliaries.

An extremely fine degree of control is obtained by the PCL double-end control equipment. There are 22 notches on the controller, spaced to give the most desirable steps between minimum and maximum voltage on the traction motors. However, as it may sometimes be advantageous to have available on heavy freight drags a still finer degree of control, there is provided between each of the 22 steps an additional two steps which are obtained by lifting the controller handle vertically and then lowering it to its original position. Thus a total of 66 steps are available though the intermediate steps are definite voltage increments of the same value for each notch and therefore on some notches the increments are not evenly spaced. But on the notches where locomotive slipping is likely to occur the increments are approximately even and full advantage can be taken of the intermediate steps where they are really needed.

Similar to the corresponding a. c. equipment on the 0361 class of locomotive are the two spring-raised, air-lowered, double-pan slider pantograph collectors; the dead-man's release feature; oil circuit breaker; lightning arrester and electro-pneumatic reversers and contactors.

An interesting feature in connection with the protective and operative relays is that they are designed to make contact automatically with their electrical circuits as they are mounted in position. This is accomplished by providing spring contacts as part of the locomotive wiring which make contact with studs on the backs of the relays. Thus the removal of a relay from the locomotive for repair or overhaul is greatly facilitated.

Arrangement of Equipment

Unit assembly of the electrical equipment provides a compact and simple layout, particularly as the control of the traction motors is devoted solely to a. c. operation.

The motor leads from each of the three groups of two twin traction motors in series are brought up into the cab adjacent to the three-motor control units. These motor control units contain the control equipment required by their respective groups of traction motors.

The voltage control unit, comprising the transformer, tap contactors, auxiliary transformer and preventive coils is centrally located in the cab and feeds the three motor-control units.

The auxiliary control unit contains the control equipment required by the various auxiliaries and is mounted at one end of the cab adjacent to the relay cabinet.

Auxiliaries

The locomotive is equipped with two type CPA-32 compressors providing a total displacement of 200 cu. ft. of air a minute. The compressors are driven by a. c. series motors.

Westinghouse No. 8 EL brake equipment is employed.

The two blowers supply a total of 50,000 cu. ft. of air a minute which ventilates the traction motors, the transformer equipment, the blower motors and the motor-control units. In addition, the blowers also separate a large percentage of the dirt and moisture from the incoming air as was done on the 0361 class of locomotive. Experience obtained over a number of years has indicated that the air-cleaning feature is extremely desirable. Two-speed operation of the blowers conserves power and reduces blower noise when full ventilation is unnecessary. The blowers are driven by series-wound compensated commutator type a. c. motors, each of which drives a direct-connected 1½ kw. 32-volt (nominal) d. c. generator for battery-charging and control energy.

The storage battery is of the alkaline type consisting of 25 cells of Edison A4-H battery.

The locomotives are equipped with four-indication coded cab signal equipment supplied by the General Railway Signal Company.

Accessories include sanders, bells, speed indicators, horns, defrosters, air-operated window wipers and fire extinguishers.

Critical Material Savings

Since the locomotives were built under war-time restrictions, every effort was made to conserve critical materials without sacrificing reliability. In addition to savings accomplished by the use of emergency material specifications, direct savings on the lot of five locomotives were made as follows:

Brass, by redesign of bearings, thrustplates, bells and marker lights, lb.	2,225
Copper, by substitution of iron pipe and fittings, lb.	6,250
Tin, by minimizing the number of soldered joints in wiring, lb.	50
Aluminum, by substitution of iron medallion castings and steel in the pantographs, lb.	600
Rubber, by redesign of hatch cover gaskets, lb.	220

Plastics for the Railroads

THE use of plastics on the railroads is not yet extensive enough so that mechanical engineers and shop supervisors are even fairly familiar with the wide range of products and the variation in properties available in these materials. To many "plastics" is only a word. As a word, it represents, however, as wide a field in chemical and physical properties as is included in the metallurgical properties of the better known metals, alloys, etc. It appears evident that, in the post-war period, there will be an increased use of many of the plastic materials which are now proving themselves in war applications. The

Decorative uses of plastic materials offer a wide range of possibilities for designers—This lounge car shows some of the uses already made

materials will be new and the method of their use will require study; most of them do not fit into patterns set in more familiar designing and engineering. Many of them are, of course, alternate materials which can be employed in place of those now used; others require a thorough understanding of their properties before it can be determined whether their adoption will justify their substitution for what has proved satisfactory in the past.

In the Roundtable discussion in the July issue of the *Railway Mechanical Engineer,* it was made evident that there was considerable interest on the part of railroad men in the prospective uses of plastic materials. It was almost equally evident that few had had sufficient experience with them to be able to estimate the possibilities for further adoption of such products on the railroads. It is also true that, although the manufacturers of plastic products are interested in all possible outlets for their plant capacities after the war, they are not too familiar with the requirements of the railroads. The comment made by a representative of one of the largest manufacturers of basic plastic materials indicates this lack of understanding. "The potential applications of plastics in the railway industry are quite large but we feel that we are going to have to rely on the experience of people in that field for suggestions and developments. We, of course, will be glad to cooperate in any way possible by supplying physical data and special laboratory information concerning our products."

Another writes that, "We consider your industry one which will use more and more plastics as time goes on, particularly the laminated type of high impact strength, and we foresee considerable use of resin bonded plywood in railway car construction after the present emergency. Considerable study of the properties of the several plastics on the market today is of prime importance to railway car designers." A representative of a company which has had long experience in dealing with the requirements of the railroads with respect to signal system insulation approaches the problem of general use in a somewhat different manner. He says, in part, "This company is not considering the railroad field as an unusually important outlet for our materials after the war, simply because we do not have knowledge of specific applications, which, to our mind, would warrant a consistent promotional effort. The field, however, is one of possible use, particularly as engineers engaged in that field will investigate the possibilities of plastics. I would like to offer a suggestion when approaching the subject of plastics. The first job that needs to be done is to make it clear that you cannot speak of plastics as a group of materials having certain properties in common with each other. Thus, in your Roundtable, Mr. Christiansen, when he asks about the shock resistance of plastics, is asking a question too general to be susceptible of a simple answer. One might as well ask what the shock resistance of metals is. The answer, in the case of plastics, is as varied as the answer would be in the case of metals."

What Are Plastics?

Plastics, in the industry, are generally divided into two main groups; thermosetting materials and thermoplastic materials. The thermosetting materials are those which undergo a chemical change when heat and pressure are applied. After forming, their nature is such that they do not soften to any appreciable extent under heat. In this group are included the phenol formaldehyde, phenol

Courtesy Dow Chemical Company

Journal box lid made by the Railway Service and Supply Corp. from Ethocel—This ethyl cellulose material offers many possibilities for molded products when materials are again available

furfural, cast phenolic, melamine formaldehyde and urea formaldehyde materials. The thermoplastic materials undergo no chemical change under heat and pressure although they soften. However, when cool, they harden and can then be reworked as necessary. In this group are included the cellulose acetate compounds, the cellulose acetate-butyrate products, the ethyl cellulose, polystyrene, methyl methycrylate, vinyl chloride-acetates and vinylidene chlorides. Some can be cast, others molded. Some can be produced in sheets, others as tubes or rods, others as fine threads which can be spun and woven into a variety of cloths made to meet either appearance or service specifications. In addition, there are various resins utilized in the manufacture of laminated products or employed to impregnate cloths, papers, etc.

Physical Properties

The various plastics producers, limit themselves in their claims, when presenting the qualities of their products, to known or probable applications. Various enthusiasts envisage a "plastics world" when the war is over but they have no supporters among the technical men engaged in the development of plastic materials.

Car interiors have been brightened by the use of plastic products

When given the physical requirements for a material, plastics engineers want to cooperate in developing a product which meets these requirements. In general, it can be said that the phenol-formaldehyde compounds when molded, have a tensile strength of from 4,000 to 18,000 lb. per sq. in.; in the laminated form they vary from 8,000 to 20,000 lb.; when cast the range for grades suitable for electrical or mechanical needs will approach 20,000 lb. per sq. in. Variations in properties of the molded products depends, in part, upon the type of filler used and the same is true for laminated products where consideration must be given to the base material which is used. As fillers for molding, macerated fabrics, woodflour, various mineral type fillers and sisal felt fillers are used. Some molded products are made without any filler material. Laminated products may have a variety of bases, the most common paper and cotton fabrics.

The Plastics Catalog* lists the following as being the generally recognized types of plastics: Phenol-formal-

* Published 1943 by the Plastics Catalogue Corporation, New York.

Lighting fixtures in many cars are being made of plastics which offer a wide range of color characteristics and have good optical qualities

Manufacturers and Trade Names*

PHENOL-FORMALDEHYDE MOLDING COMPOUNDS

Bakelite	Bakelite Corp., New York
Durez	Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y.
Durite	Durite Plastics, Philadelphia, Pa.
Heresite	Heresite & Chem. Co., Manitowac, Wis.
Indur	Reilly Tar & Chemical Corp., New York
Insurok	Richardson Co., Chicago
Makalot	Makalot Corp., Boston, Mass.
Neillite	Watertown Mfg. Co., Watertown, Conn.
Resinox	Monsanto Chem. Co., Springfield, Mass.
Textolite	General Electric Co., Pittsfield, Mass.
Co-ro-lite (Sisal)	Columbian Rope Co., Auburn, N. Y.

PHENOL-FORMALDEHYDE LAMINATED PRODUCTS

Aqualite	Nat. Vulcanized Fibre Co., Wilmington, Del.
Celoron } Dilecto }	Continental-Diamond Fibre Co., Newark, Del.
Duraloy	Detroit Paper Products Corp., Detroit
Farlite	Farley & Loetscher Mfg. Co., Dubuque, Iowa
Formica	Formica Insulation Co., Cincinnati, Ohio
Insurok	Richardson Co., Chicago
Lamicoid	Mica Insulator Co., New York
Micarta	Westinghouse Electric & Mfg. Co., Trafford, Pa.
Ohmoid	Wilmington Fibre Specialty Co., East Wilmington, Del.
Panelyte	Panelyte Corp., New York
Phenolite	Nat. Vulcanized Fibre Co., Wilmington, Del.
Spauldite	Spaulding Fibre Co., Tonawanda, N. Y.
Synthane	Synthane Corp., Oaks, Pa.
Taylor	Taylor Fibre Co., Norristown, Pa.
Textolite	General Electric Co., Pittsfield, Mass.
Ucinite	United-Carr Fastener, Cambridge, Mass.

PHENOL-FORMALDEHYDE CAST PLASTICS (no filler)

Bakelite	Bakelite Corp., New York
Baker Resin	Baker Oil Tools, Inc., Los Angeles, Calif.
Catalin	Catalin Corp., New York
Gemstone	A. Knoedler Co., Lancaster, Pa.
Marblette	Marblette Corp., Long Island City, N. Y.
Opalon	Monsanto Chem. Co., Springfield, Mass.

PHENOL-FORMALDEHYDE CAST (Asbestos filler)

Haveg	Haveg Corp., Newark, Del.

PHENOL-FURFURAL RESINS

Durite	Durite Plastics, Philadelphia, Pa.

UREA-FORMALDEHYDE COMPOUNDS

Bakelite	Bakelite Corp., New York
Beetle	American Cyanamid Co., New York
Cibanoid	Ciba Co., Inc., New York
Plaskon	Plaskon Co., Inc., Toledo, Ohio
Uformite	Resinous Prod. & Chem. Co., Philadelphia

MELAMINE-FORMALDEHYDE COMPOUNDS

Catalin Type	Catalin Corp., New York
Melmac	American Cyanamid Co., New York
Plaskon Type	Plaskon Co., Inc., Toledo, Ohio

ANILINE-FORMALDEHYDE RESIN

Cibanite	Ciba Co., Inc., New York
Dilectene	Continental-Diamond Fibre Co., Newark, Del.

LIGNIN PLASTIC

Benalite	Masonite Corp., Laurel, Miss.
Lignolite	Marathon Chemical Co., Rothschild, Wis.

VULCANIZED FIBRE

Diamond Fibre	Continental-Diamond Fibre Co., Newark, Del.
National	Nat. Vulcanized Fibre, Wilmington, Del.
Taylor	Taylor Fibre Co., Norristown, Pa.
Vulcoid	Continental-Diamond Fibre Co., Newark, Del.

COLD-MOLDED—Bituminous type (non-refractory)

Aico	Amer. Insulator Corp., New Freedom, Pa.
Amerine (phenolic)	Amer. Insulator Corp., New Freedom, Pa.
Cetec—non-refractory	General Electric Co., Pittsfield, Mass.
Ebrok	Richardson Co., Chicago
Gummon	Garfield Mfg. Co., Garfield, N. J.
Okon	American Hard Rubber Co., New York
Thermoplax	Cutler-Hammer, Inc., Milwaukee, Wis.

COLD-MOLDED—Ceramic type (refractory)
Aco—5 .....Amer. Insulator Corp., New Freedom, Pa.
Alphide .....Standard Plastics Corp., Jersey City
Cetec—refractory ..General Electric Co., Pittsfield, Mass.
Coltstone .....Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Hemit .....Garfield Mfg. Co., Garfield, N. J.

CASEIN
Ameroid .....American Plastics Corp., New York
Galorn .....Geo. Morrell Corp., Muskegon Heights, Mich.

SHELLAC COMPOUND
Complac .....Poinsettia Inc., Pitman, N. J.
Compo-Site .....Compo-Site Inc., Newark, N. J.
Harvite ..... Siemon Co., Bridgeport, Conn.
Lacanite ..... Consolidated Molded Products Corp., Scranton, Pa.

VINYL CHLORIDE ACETATE RESINS
Vinylite .....Carbide & Carbon Chem. Corp., New York

VINYL CHLORIDE RESINS
Koroseal .....B. F. Goodrich Co., Akron, Ohio
Vinylite .....Carbide & Carbon Chem. Corp., New York

VINYLIDENE CHLORIDE RESINS
Saran .....Dow Chemical Co., Midland, Mich.
Mills plastic .....Elmer E. Mills Corp., Chicago
Vec .....Pierce Plastics Inc., Bay City, Mich.
Velon .....Firestone Rubber & Latex Co., Fall River, Mass.

VINYL BUTYRAL RESIN
Butacite .....E. I. du Pont de Nemours & Co., Inc., Arlington, N. J.
Butvar .....Shawinigan Products Corp., New York
Saflex .....Monsanto Chem. Co., Springfield, Mass.
Saflex TS .....Monsanto Chem. Co., Springfield, Mass.
Vinylite X .....Carbide & Carbon Chem. Corp., New York

VINYL ALCOHOL RESIN
PVA .....E. I. du Pont de Nemours & Co., Inc., Arlington, N. J.
Resistoflex .....Resistoflex Corp., Belleville, N. J.

METHYL METHACRYLATE
Crystalite .....Rohm & Haas Co., Inc., Philadelphia, Pa.
Lucite .....E. I. du Pont de Nemours & Co., Inc., Arlington, N. J.
Plexiglas .....Rohm & Haas Co., Inc., Philadelphia, Pa.

POLYSTYRENE
Bakelite .....Bakelite Corp., New York
Loalin .....Catalin Corp., New York
Lustron .....Monsanto Chem. Co., Springfield, Mass.
Styron .....Dow Chemical Co., Midland, Mich.

NYLON RESINS
Nylon .....E. I. du Pont de Nemours & Co., Inc., Arlington, N. J.

RUBBER COMPOUNDS
Chlorinated rubber
Marbon .....Marbo Products Corp., Chicago
Parlon .....Hercules Powder Co., Wilmington, Del.

Modified isomerized rubber
Pliofoorm .....Goodyear Tire & Rubber Co., Akron, Ohio
Pliolite .....Goodyear Tire & Rubber Co., Akron, Ohio

Hard rubber
Ace .....American Hard Rubber Co., New York
Luzerne .....Luzerne Rubber Co., Trenton, N. J.
Rub-tex .....Richardson Co., Chicago

ORGANIC POLYSULFIDES
Thiokol .....Thiokol Corp., Trenton, N. J.

CELLULOSE COMPOUNDS
Ethylcellulose
Ethocel .....Dow Chemical Co., Midland, Mich.
Hercules E.C. .....Hercules Powder Co., Wilmington, Del.

Cellulose acetate
Bakelite .....Bakelite Corp., New York
Herculoid .....Hercules Powder Co., Wilmington, Del.
Fibestos .....Monsanto Chem. Co., Springfield, Mass.
Lumarith .....Celanese Celluloid Corp., New York
Nixonite .....Nixon Nitration Works, Nixon, N. J.
Plastacele .....E. I. du Pont de Nemours & Co., Inc., Arlington, N. J.
Tenite I .....Tenn. Eastman Corp., Kingsport, Tenn.

Cellulose acetate butyrate
Tenite II .....Tenn. Eastman Corp., Kingsport, Tenn.

Cellulose nitrate
Celluloid .....Celanese Celluoid Corp., New York
Nitron .....Monsanto Chem. Co., Springfield, Mass.
Nixonoid .....Nixon Nitration Works, Nixon, N. J.
Pyralin .....E. I. du Pont de Nemours & Co., Inc., Arlington, N. J.
Hercules C.N. .....Hercules Powder Co., Wilmington, Del.

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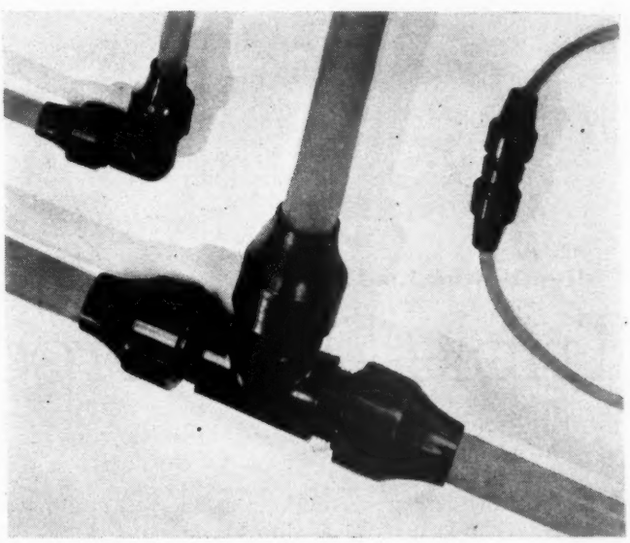
dehyde compounds; phenol-furfural compounds; urea-formaldehyde compounds; melamine-formaldehyde compounds; aniline-formaldehyde resin; lignin plastic (laminated); vulcanized fibres; cold molded products, either organic or inorganic, the organic being non-refractory in nature, the inorganic being a refractory material; casein products, shellac compounds; vinyl chloride acetate resins; polyvinol acetate resins; polyvinol chloride resins (plasticized); vinylidene chloride resins (molding); polyvinol butyral resins; polyvinol alcohol; methyl methacrylate resin; polystyrene; nylon resins (molding); rubber compounds; organic polysulfide molding compound; and, cellulose compounds.

Within this wide range of available materials there exists the prospect for development of many products which could be used in the railway locomotive and car fields. Physical properties vary widely, depending on the type of plastic material employed. Some excel in properties demanded for structural uses; others for those in purely decorative uses. Those which are to be used in electrical applications must be selected in the light of their dielectric properties and adopted or rejected after study. Particularly important, in the case of some plastic materials, is their water absorption factor.

Other characteristics must be taken into account when considering the adoption of a plastic product in place of a previously used material. There is, for example, the need for determining the effect that age, sunlight, acids or alkalies, in their various strengths, will have upon the material chosen. The possibilities in color selection and in clarity of the materials must, sometimes, be known before selections can be made.



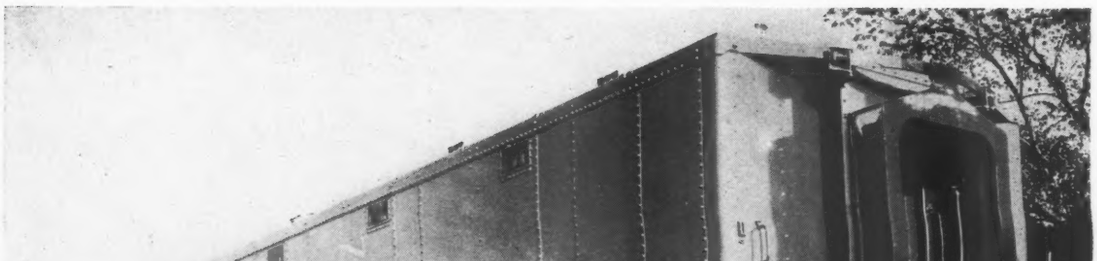
Rigid and flexible type tubings, with needed fittings, are being manufactured

Selecting A Plastic

In general, it can be said that the primary characteristics of interest to designers and engineers will be the factors of weight, impact strength, tensile strength, compressive strength, moisture resistance and electrical properties. Certain types of plastics have a high rating in some of these qualities, other materials excel in others. The aircraft industry has found that a number of plastics are suitable for use in non-structural applications and provide a considerable saving in weight. The fairly high strength-weight ratio of many seems to offer a field for investigation in the designing of railway equipment. Some of the plastics are valuable in damping out vibratory stresses.

Laminated phenolics are highest in the factors which are of most interest in a structural material. Tensile strength, depending upon the method of manufacture approaches 20,000 lb. per sq. in., compressive strength about 44,000 lb. per sq. in., and impact strength about 8.0 under the Izod test using a ½-in. by ½-in. notched

(*Continued on page 459*)



Pullman-Standard Builds

Triple-Deck Troop Sleepers

The cars, based on standard box-car design, have berths for 30, Passenger-car trucks and complete equipment for operation in passenger trains—Weight, 76,300 lb.

THE first of 1,200 triple-deck troop sleeping cars, the construction of which is based on a standard A. A. R. steel-sheathed box car, was previewed at Washington, D. C., by officers of the Transportation Corps of the Army Service Forces on September 4. The production schedules call for completion of the order by the first of next year. The cars are being built by the Pullman-Standard Car Manufacturing Company and will be operated and maintained by the Pullman Company in arrangements approved by the Army Transportation Corps and the Association of American Railroads.

The cost of building these cars will be a small fraction of the cost of a standard Pullman sleeping car. The character of the service which they will render, however, will be along standard Pullman Company lines. This was made clear in a memorandum to Pullman car-service employees written by Fred Callahan, general manager of the Pullman Company, preparatory to their operation, which reads in part as follows:

"Our service in these cars is to conform in every respect to the customer service you are accustomed to deliver in connection with the regular Pullmans. These cars will bear the name Pullman. They will be serviced with linen and other supplies in the same manner as all other Pullmans. There will be a berth for every man and bedding will be changed nightly by the porter. The kind of service on which we have built our reputation will be the same in every possible respect. In other words, all of the operating procedures which we employ with respect to all of our cars will be in effect in full in the case of the new troop sleepers."

The new Pullman double-deck sleeper is primarily of riveted carbon-steel construction with heavily reinforced ends and weighs 76,300 lb. The design is based on that of the A. A. R. standard 50-ft. 6-in. steel-sheathed box car. The length over buffers, coupled, is 54 ft. 2½ in. The cars are 9 ft. 1⅜ in. wide inside and 9 ft. 9⅝ in. over the side sills. The height inside at the center is 9 ft. 5 in. Truck centers are spaced 40 ft. 8½ in.

The structure has been modified to accommodate the windows in the sides and the side doors and step wells which break the continuity of the bottom chord member of the car side. Most of the intermediate side posts are 3-in. 5.1-lb. rolled Z-bars. Others, however, are of $\frac{3}{16}$-in. pressed plate, as are also the side-door and corner posts. The pressed-steel intermediate posts are applied in the narrow pilasters between the windows in each pair.

Because of the interruption in the side structure of the car caused by the side doors and step wells, a 7-in. 18.8-lb. car channel is attached below the side-sill be-

tween the cross-bearers at the center of the car and pressed inward to extend around the back of the step well where it forms the riser of the top step. The top flange of this channel is riveted securely to the horizontal flange of the side-sill angle. The sides of the step well are closed with pressed pans.

The flooring, except at the ends of the car, is 1¾-in. by 5 1/16-in. tongue-and-groove material which is applied across the car the same as on a freight car and is bolted directly to the side sills and floor stringers. At the ends the floor forms a raised platform nailed to wood fillers which are placed on top of the intermediate stringers to conform to standard passenger-car floor height. The top flooring is brown asphaltum tile, 3/16 in. thick, cemented directly to the wood flooring. A sloping ramp is provided in the aisle at each end leading to the elevated floor. This is covered with a non-slip metal tread.

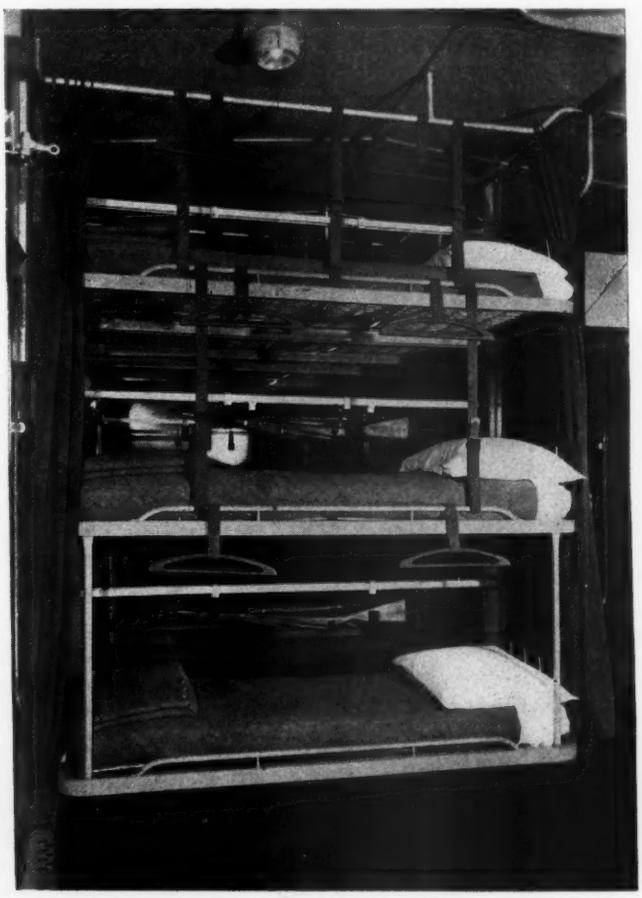
The walls and ceilings are insulated with a 1-in. blanket. The insulation is secured to the side and end sheathing by means of nails welded to the sheets. The ceiling insulation is cemented directly against the roof sheets. The floors are not insulated.

The car is designed for full service interchangeability with all other cars, is equipped with high-speed passenger-train-car trucks and springs, and therefore can be operated in any type of passenger train. The end doors are similar to those on standard railway passenger cars. There are no vestibules, but each car is fitted with passenger-car diaphragms and face plates with semi-elliptic upper spring arrangement and side buffer stems behind the bottom buffer face plate. At each end is an anti-climbing arrangement which interlocks between the cars when coupled under full compression and is designed to resist a vertical load of 130,000 lb. within the yield point of its parts and attachments.

Each section has two automotive type lamps with diffusing type cover glass

The cars are equipped with two AB-1-B type control valves and two 10-in. by 12-in. brake cylinders. The water supply consists of 150 gals. per car stored in overhead flat tanks at each end and with gravity flow. The tanks are filled through water filling nozzles at the side-sill level at each corner of the car and can be quickly and completely drained. An extra layer of insulation is applied over the top and at the ends of each tank and provision is made for circulating warm air from the inside of the car within the boxing around the tanks.

Sliding doors on each side at about the center of the car, with trap doors and steps, facilitate loading and unloading. On each side of the main body of the car there are ten sliding windows about 2½ ft. wide and 3 ft. high. Each window is equipped with roll shades and steel mesh screens. These large windows give ample light in the daytime, and, with the seats arranged for daytime occupancy, clear and unobstructed vision to the outside. Each window is easily raised or lowered so that fresh air may circulate freely throughout the car, as required. In addition to these main car windows, there is a window at each end of the car beside the wash basins and a window in each toilet room.



The berths are made up with standard Pullman bedding—There is a rifle rack for each occupant

Eight exhaust ventilators in the roof and inlet ventilators in the sides near the eaves insure adequate ventilation under all conditions. A low-pressure, vapor heating system, with fin-type radiation, is installed. The heating is controlled by four hand valves, two placed on each side of the car, with stencil markings showing their location. The ceilings and sides of the car are lined with a composition material which makes a smooth interior, painted in three-tone tans.

Passenger Accommodations

When made up for night occupancy, with sleeping accommodations for 30 passengers, each in an individual bed, the car has berths arranged in tiers of three running crosswise, with the aisle along the side instead of in the center as in the conventional sleeping car. The floor is covered with brown asphaltum, designed to be durable and long wearing but soft and springy.

For daytime use, the top berths remain fixed, forming a ceiling for the section and space for the storage of bedding and linen. The middle berth, which is hinged, drops down to form a back for the seat converted from the lower berth. The wide seats thus provided by each lower berth in each section are more than ample for three passengers, affording plenty of leg room and the opportunity for comfortable sitting or lounging positions.

Each berth has a steel bed spring and a mattress, the latter for the lower berth forming the cushion for the seat for daytime use. Each tier of berths has curtains for use when the cars are operated in regular trains or when the cars are occupied by WACS or WAVES, or other women members of the military forces. Pullman fabric guards have been placed on each upper and middle berth. Standard Pullman bedding, consisting of sheets, pillows, pillow cases and blankets, is furnished for each berth and while the cars are in service the linen is changed every night. Two durable wooden coat hangers are permanently attached to each berth. There is also a rack for the soldier's rifle.

There are four wash basins, two at each end of the car, with cold and hot water faucets, and two enclosed toilets, one at each end of the car. Close by the wash basins are the time-honored Pullman razor slot for the disposal of used razor blades. Above the wash basins are wide, deep mirrors, and near by a paper towel dispenser and waste rack for used towels. There is a drinking-water cooler with a dispenser for sanitary drinking cups at one end of the car.

The 30 berths are numbered and when the car is in service one of the end upper berths is reserved for the porter. Two porter's lockers are installed, one at each end of the car, for the storage of linen and other supplies. Between each pair of upper berths there is a rack for the storage of baggage or linen. This is attached to the side of the car at the level of the upper berths, to which it is bolted. The rack projects about 24 in. from the side of the car and does not interfere with access to the berth.

Perforated grilles cover all heating pipes throughout the car. An emergency tool rack, enclosed in glass, is located above one of the side doors for easy accessibility. Two chemical fire extinguishers, enclosed in glass cases, of easy accessibility, are installed in each car. There is also a first-aid package in a locked container on one of the side walls.

The current for the electric-lighting system is furnished from replaceable primary-type batteries without axle generator equipment. The batteries are housed in steel boxes mounted on the side wall, approximately seven feet above the passageway floor. There are 12 fixtures, consisting of a metal casing containing a silverplated reflector, a switch, and a diffusing type of cover glass. Two of these fixtures are mounted over the wash basins, one at each end of the car; two on each side of the ceiling in the center portion of the car between the side doors, and eight arranged in pairs on the side wall in each section. The 5¾-in. light fixtures are of the automotive type. For the night light circuit, there is one ceiling fixture in each toilet, one in front of each end door, and two in the ceiling of each passageway. These have reflectors and glass covers arranged to throw a narrow beam of light on the

The intermediate berth forms the back of the seat during the day—The upper berths remain in night position—Lighting battery boxes are placed over the aisle

The enclosed porter's berth at one end of the car is accessible from the transverse corridor opposite the end door

floor without disturbing the sleeping passengers. The illumination, thus made available, will permit the occupants of the cars to read, write letters and play cards.

Kitchen Cars Also Being Built

In addition to the troop sleepers, 400 new kitchen cars are under construction and will also be government owned, and operated and maintained by The Pullman Company as part of its "pool," except for the food service which will be army rations handled by regular army mess crews.

Plastics for the Railroads

(*Continued from page 455*)

bar. In addition, the flexural qualities are good as are the electrical properties. The moisture absorption rate varies according to the base used but, generally, is quite low. Color possibilities in this type of plastic are limited and they can be manufactured, because of the use of a paper, cloth or other base, only as opaque products.

Probable uses for plastic materials on the railroads will be determined, at least in part, by the uses to which they have been adapted in the aeronautical and marine field. These uses will serve only as indicators of the extent to which they can be employed in the mechanical department. Most of the present uses are either decorative or concerned with electrical installations. There appears to be an immediate post-war future for seat coverings, window shades, lighting fixtures, cab and vestibule curtains, molded journal box lids and other molded products. Plastic tubings may prove satisfactory in many car and locomotive uses as electrical conduits or as oil lines. Fittings for these are available. Although these pipes and tubings have proven satisfactory in many applications they have not yet been employed extensively in industries which have service requirements comparable to those of the railroads. Coming from the vinyl chloride acetate resin group they are practically immune from effects of acids or alkalies. They are not recommended for exposure to severe freezing conditions and are recommended only for temperatures which do not exceed 170 deg. F. Within the temperature ranges suggested, they are tough, durable and have good service life. When used as piping, they can be either welded or threaded. Standard pipe threading equipment can be used although certain modifications in tool grinding are necessary. In most cases, the tubing can be flared with standard equipment and the changes in practice required of a workman are readily learned.

The pipe and tubings have good physical characteristics as regards tensile strength, workability and, in the case of tubings, flexural strength. Resistance to impact is low and, as mentioned, the temperature range within which they can be employed is considerably more limited than in the case of metals. They offer an advantage by their almost complete resistance to acids and alkalies.

The molded journal box lid represents only one of the possible uses for molded products, among others being drinking fountains, toilet fixtures, etc. The laminated types offer a wide variety of possible installations in panelling, switch cabinets, freight-car linings or sheathing, temporary floorings, battery casings, etc. Various other types are likely to be found in seats, tables, upholstery and seat coverings.

Test installations of seating fabrics on the New York subways and suburban railroads running out from New York indicate that the future for seat coverings made of saran, which is a vinylidene chloride resin, is likely to be of great interest to men in the passenger car field who are interested in long service life and easy cleaning.

Courtesy Firestone Industrial Products Co.

A New York subway car with seats of saran rattan which has given several years of satisfactory service—Improved materials of fine fabric strength and in a varitety of colors and weaves will be available after the war

Increased use of plastics can be expected insofar as they are able to meet the technical requirements of the mechanical engineers.

Coupler and Draft Gear Report

A. A. R. Mechanical Division committee makes suggestions for improvement in the design and use of these two important details of car equipment

DURING the year on account of the increased movement of tank cars, many having been taken out of long storage, it was observed that a number of cars were being shopped on account of failures encountered due to coupler operating mechanisms and draft attachments requiring attention. It became necessary to issue instructions to the tank-car owners and handling lines covering the inspection and maintenance of these parts when the cars were on the shop tracks for any other attention.

On September 28, 1942, A. A. R. Circular GC-1062 was distributed to the members and tank-car owners as a guide in connection with the maintenance of this class of equipment. A report of the tests upon which this circular was based is included in Appendix A.

Failure of coupler butts and yokes in service due to cracks, resulting in couplers pulling out, is one of the most serious causes of train partings. The circular Exhibit A directs attention to these critical cracks and methods of detecting them.

Appendix A—Parting of Couplers on Tank Cars

In June, 1942, the attention of your committee was called to an excessive number of train partings in which tank cars were principally involved.

A prompt investigation was undertaken which led to a series of tests on the New York Central.

Within four days after completion of these tests arrangements were made for a joint meeting of all member roads and tank car owners which was held in Chicago on August 12 to consider the results of these tests and take appropriate action. In the meantime the test data had been analyzed and the following conclusions had been reached by the test observers:

"It is fairly clear that the principal factors contributing to the parting of the tank cars are:

a—Loaded tank cars bounce more violently than loaded box or hopper cars or any other type of freight car observed.

b—It has been observed that coupler locks actually do lift when this bouncing occurs and certain other conditions are present.

c—To permit the coupler to open, however, the car must not only bounce violently but the pulling tension on the coupler must be relieved. This accounts for the fact that most partings on the New York Central are reported to occur at or near the bottom of a descending grade, as at Conneaut, Dunkirk, Churchville and Belle Isle.

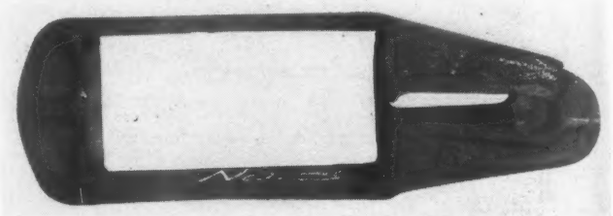
d—The critical speed for bouncing is between 40 and 55 miles per hour, varying apparently with the ratio of load to spring capacity, track conditions, etc. On Track 2 (eastbound high speed passenger track) the most violent bouncing occurs at speeds between 50 and 55 miles per hour.

e—The condition of coupler operating levers and attachments is a contributory cause of parting. Many of these attachments on tank cars are crude "home made" variations of different standard designs, which irregularities facilitate the lifting of coupler locks when bouncing occurs.

f—Excessive draft gear slack is objectionable, but few of the tank cars observed possessed this defect."

The Chicago meeting on August 12 was attended by 48 persons, representing 16 of the leading railroads and 11 of the principal tank car owners, the latter representing an ownership of 91,087 tank cars. At this meeting it was unanimously voted:

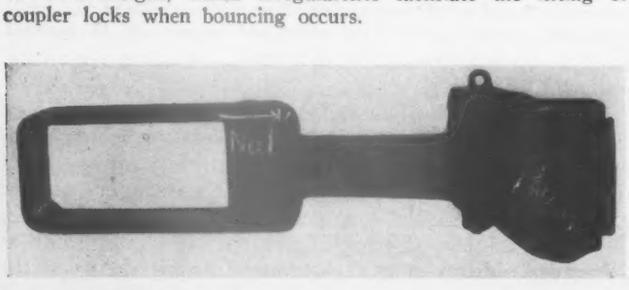
1—That spring snubbers should be applied to all tank cars as rapidly as they can be obtained, these snubbers to be applied both by the railroads and the car owners. When railroads apply the snubbers they are to be billed against the car owner at A. A. R. prices.



Cast steel yoke with a typical failure crack at the front end of the key slot

2—That a circular of instructions be issued to railroads and car owners requiring that tank cars be inspected and conditioned before loading so that they may be reasonably expected to go through to destination without the necessity of intermediate shopping and repairs; also that similar attention should be given to cars when made empty at destination. Definite steps to be taken by tank car owners to provide facilities and labor required to make these inspections and repairs or to arrange for this to be done by some railroad. Especial attention is to be given to the correction of irregularities in couplers, uncoupling mechanism, draft gears and attachments.

A subcommittee, consisting of representatives of the Pennsylvania, Southern Pacific, Missouri Pacific, New York Central and four leading tank car owners, was appointed to draft specific programs to carry out the above



A wrought yoke with a hairline crack in the top lug

Cast steel yoke with a crack in the bottom corner of the housing

decisions. This subcommittee met next day, and agreed upon programs which were subsequently approved by the A. A. R. and the tank car owners.

All tank car owners were requested to submit monthly reports of progress made in the application of snubbers. An analysis of the latest summary of these reports, covering status as of February 1, 1943, reveals wide difference in the degrees of diligence exercised by the various tank car owners in carrying out the recommendations to apply snubbers to all of their cars. The results may be summarized as follows:

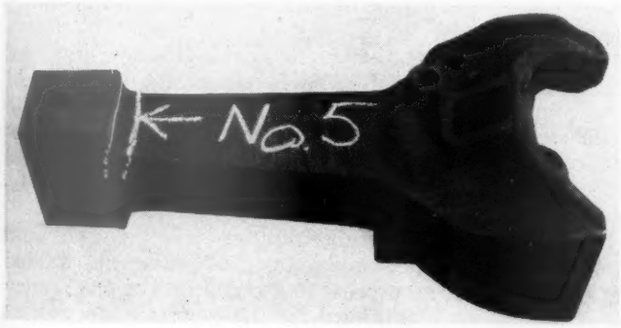
1—40 owners, representing a total of 2,803 cars, report 100 per cent of cars equipped.

2—All owners reporting, representing a total of 139,381 cars, report an aggregate average of 28 per cent of cars equipped.

3—One large tank car owner, representing an ownership of 38,706 cars, reports 49 per cent, or nearly half of these cars equipped to date. At this rate this owner will have all cars equipped before August 1 of this year.

4—Another large tank car owner, representing an ownership of 27,755 cars, reports only 3.7 per cent of these cars equipped. At this rate this owner will require more than ten years to equip all cars.

5—40 owners, representing a total of 1,015 cars, who have withheld the granting of authority to equip their cars with snubbers but have stated that they have made their own arrangements to have this done, show no cars equipped to date.



A coupler cracked at the juncture of the shank and butt

6—42 owners, representing a total of 2,346 cars, report no program for equipping cars nor for having them equipped.

Exhibit A—Proposed Circular to Members and Tank-Car Owners—Inspection of Couplers for Cracks

A circular, dated January 21, 1943, called attention to certain specific items in connection with the inspection and maintenance of tank cars that should be given particular attention. It also directed attention to a number of other conditions that should not be overlooked when cars are available on the shop track for such inspection and attention.

The type of defect that is likely to result in a train separation, possibly derailment, if not detected and the coupler renewed, is shown on the attached four photographs of riveted yoke and vertical key type couplers removed from tank cars.

With the riveted yoke type, careful inspection with a spotlight should disclose any crack along the side of the coupler shank below the key slot and cracks occurring across the bottom surface of the coupler shank should be detected unless obstructed from view by the end of the coupler yoke. On couplers applied with vertical cast steel yokes, the butt section cannot be inspected unless there is occasion for removing the coupler.

While inspecting the coupler shank for cracks, attention should also be given to the condition of riveted yokes. A crack in the bend of the yoke where it is formed over the butt of the coupler indicates the rivets are loose and are worn or partially sheared; this or any other condition indicating broken or loose rivets warrants the renewal of the yoke, rivets or both. When opportunity permits, thorough inspection should be made of the back end of vertical strap yokes.

Special attention should also be given to the condition of excessive slack in draft gears and attachments as well as coupler height and excessive vertical clearance in the striker casting, either one or a combination of which may contribute to couplers overriding.

At a time like the present, when so much depends upon uninterrupted movement of tank cars carrying petroleum products, too much emphasis cannot be placed upon the importance of close inspection and maintenance of couplers and yokes.

Trains Parting Due to Toggles Inverted or Missing

In the report of this committee, for 1940, the question of train partings of cars equipped with rotary bottom-operated standard Type E couplers, due to inverted or missing toggles, was fully discussed. The report stated that your committee on February 19, 1940, had approved the redesign of the rotary lock lift and toggle assembled into one unit, secured by a rivet, to replace the two-part rotary lock-lift lever and toggle.

In the annual report for 1941, on account of additional trouble being experienced from partings due to inverted or missing rotary lock-lift toggles, your committee concurred in the recommendation of the Arbitration Committee that provision be made in the interchange rules permitting the repairing line to renew the old-style rotary lock lifter or toggle, if defective, and replacing it with suitable parts in kind or with the two parts riveted together. It was also decided to discontinue the manufacture of the old-style two-piece lifter and toggle.

A considerable number of cases of partings, knuckles coming open, have recently been experienced on account of the old-style Type E separate toggles being inverted or missing and D toggles being substituted for E toggles, in all cases destroying the anti-creep feature. In the opinon of your committee, this trouble is sufficiently serious for prompt and decisive action to eliminate the cause.

It is apparent that the action heretofore taken permitting roads voluntarily to substitute the riveted type of rotary lift lever and toggle to replace the separate rotary lift lever and toggle in repairs when cars are on the shop tracks, is not bringing about replacement of these separate toggles in the Type E coupler which have been causing trouble. The following action is, therefore, recommended:

A—All roads and individual car owners should be required to replace the separate rotary lock lift and toggle, irrespective of their condition, with the assembled unit riveted together on Type E couplers when such cars are on shop tracks.

B—Make provision in the interchange rules, that after January 1, 1945, no cars will be received in interchange equipped with the bottom rotary operated Type E couplers having separate lock-lift levers and toggles.

C—In order to bring about an immediate improvement, pending the application of the riveted assembly rotary lock lift and toggle, it is recommended that the

enclosed circular, Exhibit B, be issued to all railroads and private car lines. It shows cause for knuckles coming open in trains where the anti-creep arrangement is destroyed on either the D or E couplers due to improper application of separate toggles or missing toggles from the Type E coupler. If properly followed, it should prevent partings due to knuckles opening from improperly applied or missing toggles. (Exhibit B is not included in this abstract of the committee's report on account of space limitations.—Editor).

Yield Strength of Standard E Knuckles

Reports have been made of Type E knuckles failing in service. This matter has been handled with the coupler manufacturers' Mechanical Committee to see if the yield strength of the knuckle can be increased sufficiently to relieve partly the knuckle failure and at the same time not increase the strength of the knuckle to the point where the bar is likely to fail. Your committee is actively pursuing this matter, but at the present time can only report progress on the development.

The coupler manufacturers' Mechanical Committee reports difficulty encountered in securing suitable tubing for bushing coupler shanks, pockets and yokes where bushings are required.

Your committee well appreciates the situation with regard to obtaining certain tubings and an effort is being made through the channels of the association that may be helpful to the coupler manufacturers in securing suitable priority rating from the WPB to obtain these bushing materials. In the event the coupler manufacturers cannot furnish the bushings, it is recommended that they so advise the purchaser, requesting an expression as to whether the couplers should be furnished bored for the bushing so the purchaser can supply the bushings or whether the coupler be furnished drilled to the proper diameter to receive the pin without the bushing.

Tight-Lock Couplers

Your committee, in joint session with the Mechanical Committee of the coupler manufacturers, held in Cleveland on February 2, 1943, reviewed further improvements to the new design tight-lock coupler and also improvements that may be applied to existing tight-lock couplers. The details of these improvements were covered in a special report, February 4, 1943, to the General Committee for consideration at its meeting held in Chicago, February 10, 1943, and the various items covered by this report were approved.

The new design tight-lock coupler will be identified as A. A. R. Type H tight-lock coupler and the modified existing tight-lock couplers will be changed for rotary operation and the same principle of anti-creep arrangement incorporated as provided in the new Type H coupler.

A new design coupler operating mechanism, identified as A. A. R. Type 6, was also included in this special report. This type operating mechanism will be used to operate either A. A. R. Type H tight-lock couplers or the modified existing tight-lock coupler when changed for rotary operation. When existing tight-lock couplers are modified for rotary operation and Type 6 operating mechanism is applied, the Type H tight-lock coupler may be substituted in replacement of the existing coupler without any change to the operating mechanism. The modifications to existing tight-lock couplers to provide improved anti-creep arrangement and rotary operation are optional with the car owners.

The Mechanical Committee of the coupler manufacturers have prepared Circular No. 942-A, which covers in detail the procedure for modifying existing tight-lock couplers to include the improved anti-creep arrangement, rotary operation and Type 6 operating mechanism. This circular shows in detail the changes required in the various coupler parts and the gages necessary to make these improvements properly. This circular has been approved for printing and distribution by the Mechanical Committee of the coupler manufacturers, to the railroads wishing to modify existing tight-lock couplers. The coupler manufacturers are in a position to furnish the necessary gages and engineering assistance to make these improvements.

Your committee requests the approval of the General Committee of the action taken rather than handling it by the issuance of a circular by the Mechanical division, inasmuch as the roads having tight-lock couplers in service have been kept informed as to the progress of the work and due to the Mechanical Committee of the coupler manufacturers following up in detail the changes being made.

Limitations on Welding Couplers and Cast Steel Coupler Yokes

In an effort to conserve material to the utmost during the war emergency, your committee in March, 1942, appointed a subcommittee to conduct tests of couplers and yokes that had been welded by the electric process, to determine the extent to which welding could be safely permitted.

With the co-operation of the Erie, Pennsylvania and New York Central, also the Mechanical Committee of the coupler manufacturers, these tests were completed. The recommendations submitted were subsequently approved, with some modifications, by this committee and the Committee on Car Construction and then incorporated in the interchange rules.

Later, the original subcommittee was enlarged and instructed to conduct similar tests on specimens welded by the oxyacetylene process to ascertain if the emergency provisions already approved for these parts when welded by the electric process could be extended with safety to include the oxyacetylene process.

These latter tests are now in progress and a report of all the activities of this subcommittee, including proposed tests of welded side frames, will be presented in a subsequent report.

Welding Metal Shims on Butts of Couplers

Several railroads have stated that they have an accumulation of 5-in. by 7-in. 6½-in. butt couplers for which they have only a limited use, but are badly in need of 5-in. by 7-in. 9⅛-in. butt couplers. Permission is requested to weld metal plates to the side of the butt of the 6½-in. couplers to bring them up to 9⅛-in. size.

The subcommittee on Welding of Couplers and Cast Steel Yokes has been instructed to conduct tests and submit recommendations. It has been decided that dynamic tests are necessary and tests of standard 9⅛-in. butt couplers will be used as a basis for comparison. Arrangements have been made to obtain the necessary specimens from the Pennsylvania and the tests will be made within the next few weeks under the 27,000-lb. drop hammer in the Association laboratory at Purdue University.

Report of Subcommittee on Draft Gears

Approved Draft Gears

The number of approved draft gears still stands at twelve which are made by six different manufacturers.

Two of these gears are conditionally approved, and have been so for a period of more than two years, but it has not been thought necessary to take action to change this status because few, if any, of these two types of gears have been sold. The chief purpose of conditional approval is to prevent too extensive use of gears having a background which consists of nothing but performance in laboratory tests.

The Cardwell Type L-25-SA draft gear will be replaced in the list of approved draft gears by the Cardwell Type M-25 gear. This action finally resulted from the unsatisfactory showing made by the L-25-SA gear in the 1938 check tests. In these check tests the L-25-SA gears were found to be deficient in release action and also they failed to meet fully the minimum capacity requirements for new draft gears. In order to overcome these defects the manufacturer changed the interior design of the gear. The exterior appearance remains similar to that of the L-25-SA gear, but at the suggestion of the committee the housing for the M-25 gear has been constructed so that only the correct interior parts can be used. Since the L-25-SA gear is being replaced because it was found unsatisfactory, it is recommended that this gear be placed in the non-approved classification. Its price will be protected in interchange repairs, but it will not enjoy the benefits of permissible substitution for approved draft gears.

The Peerless Type H-1 gear has been superseded by the Peerless Type H-1B. This action likewise resulted from the unsatisfactory showing which the Type H-1 gear made in the 1938 check tests. In these check tests this gear was found to be seriously deficient in capacity. The manufacturer has made no substantial change in the design of the original gear but has established a new working-in practice which is expected to produce gears in the future that will fully meet A. A. R. requirements.

The Westinghouse Types NY-11-E and NZ-11-E draft gears have been superseded by the Types NY-11-F and NZ-11-F, respectively. In both of these cases the changes were made on the initiative of the manufacturer and consisted of slight improvements in the design of housings, which are not expected to have any effect, either favorable or unfavorable, on the action of the gear.

Laboratory tests have been made of Waugh-Clark Type 150-B draft gears, conditionally approved, embodying several modifications in construction proposed by the manufacturer. These laboratory tests are being supplemented by service tests on engine tenders on the road of one of the committee members.

As required by the regulations in the appendix to the draft gear specifications, the manufacturers of approved draft gears have been canvassed by the secretary of the Mechanical Division in order to find out if the records of approved draft gears are up to date. In this connection, as soon as a manufacturer has complied with all of the additional requirements added to the draft gear specifications by the 1941 revision he has been notified to change the marking on his approved gears to "AAR-1941". The last previous issue of the draft gear specifications was dated 1937 and all approved draft gears made since have been marked "AAR-1937".

The 1941 revision of the draft gear specifications added three requirements:—First, that the surfaces on which the gear closes shall be reasonably parallel, and perpendicular to the axis of the gear; second, that all gears in the condition as received from the manufacturer shall have a minimum capacity of 15,000 ft. lb., determined in as few as possible drops of the 27,000 lb. tup; and third, that each manufacturer must file a statement of the working-in process used during the assembly of his gear. The committee has taken steps to see that each manufacturer complies with these additional requirements, and will not permit any gear to be marked "AAR-1941" unless it meets them.

The question has been raised by one of the Canadian member roads as to what assurance can be given that all certified gears manufactured in Canada fully comply with A. A. R. requirements. Reply has been made that specific information is not available, but the facts will be ascertained as soon as possible. A. A. R. requirements are of course the same, whether gears are manufactured in Canada or in the United States.

Check Tests of Certified Draft Gears From Service

The committee has made a third check test of approved draft gears, which has been designated as the "1941 Check of Certified Draft Gears From Service". Check tests were previously made in 1938 and 1940, the gears in both of those tests being new gears secured in 1938 from railroad stock and in 1940 from manufacturer's stock. The gears in the 1941 check test were ones that had been in service for five years on 50-ton hopper cars.

The data secured in the 1941 check test confirmed the action taken as a result of the information secured in the previous check tests, and also furnished information to indicate that the whole program of certifying draft gears is having beneficial effects. Thirty-four draft gears of nine different types were inspected and tested on this program. In nearly all cases both gears and draft attachments were found in remarkably good condition.

Full details of this 1941 check test are given in Appendix B of this report (not included in the present abstract of the committee's report on account of space limitations.—Editor).

Tests of Waugh-Mat Draft Gear for Freight Service

The Waugh Equipment Company has under development a rubber draft gear for freight service which is designed to go in the standard draft gear pocket. The committee had conducted extensive tests of this gear before the present emergency arose, which has served to curtail this development. These tests included complete specification tests under the 27,000-lb. drop hammer and extensive tests on the car impact plant. Based on the information secured in these tests permission was granted for the installation of 1,400 car sets of this gear, but these installations have never been completed because of the curtailment of the use of rubber. Present reports indicated that 232 car sets have been installed. In addition to the tests conducted on these gears, the committee has secured installation data and measurements on seven car sets of gears, this to be used for future checks of their performance in service. One gear is also being held in the laboratory under continuous assembly compression, and each month a capacity test is being made on this gear to determine how it stands up. This has been continued for about a year now, and so far the gear has not lost any capacity.

(The report was signed by Chairman R. L. Kleine, assistant chief of motive power (car), Pennsylvania; vice-chairman H. W. Coddington, research and test engineer, Norfolk & Western; F. T. James, chief of motive power, Delaware, Lackawanna & Western; L. P. Michael, chief mechanical engineer, Chicago & North Western; W. Bohnstengel, engineer of tests, Atchison, Topeka & Santa Fe; H. W. Faus, engineer of motive power, New York Central. The subcommittee on draft gears included Messrs. Faus, Coddington and Bohnstengel, Mr. Faus serving as chairman. L. H. Schlatter, test department, Pennsylvania, was a member of the subcommittee.

Reading

Fuel Instruction Car

Models and operating diagrams of many appliances provide for the education both of enginemen and firemen in other phases of locomotive operation

THE Reading has recently installed a fuel instruction car which is now on its first tour of the road. This car is a steel-underframe coach which has been refitted with models and operating diagrams of most of the important pieces of apparatus installed on a locomotive. The car is primarily intended as an aid in the education of new men who are being taken into the engine service. Major emphasis is placed on firing practice and the operation of boiler feedwater equipment, although the car provides instruction material for dealing with practically, all aspects of the handling of a locomotive, with the exception of the air-brake system for which there is a separate instruction car. The fuel-instruction car is thus of almost equal service to the older enginemen as well as to the new firemen.

The car began its service in July on the Shamokin division. It was on the Reading division during August and will be run successively over the L. & S. division, the Philadelphia division, and the Central Railroad of New Jersey.

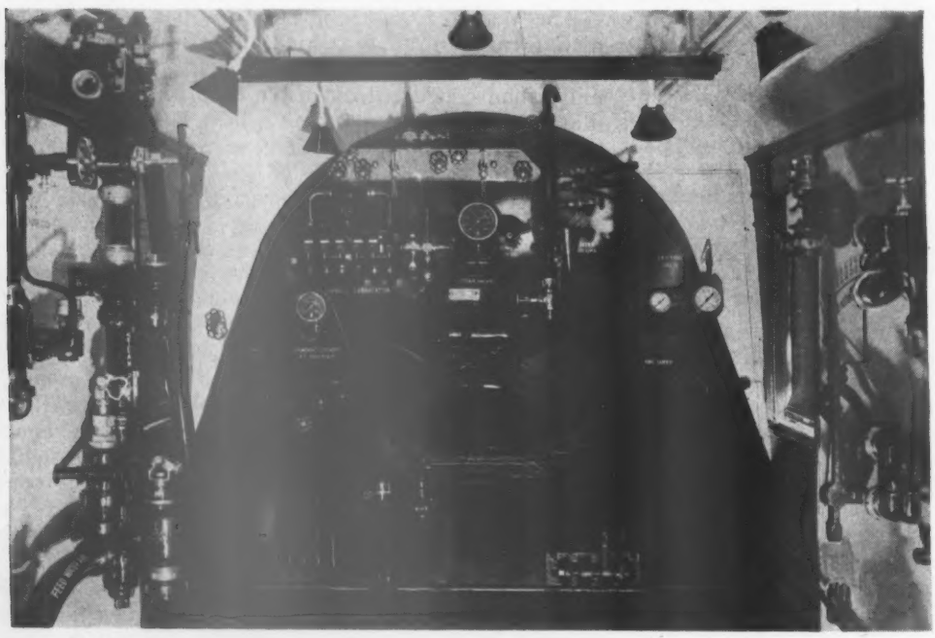
The Equipment on the Car

Across one end of the car is a full-scale dummy boiler back head on which have been placed the railroad's standard back-head mountings. These are all clearly labeled. They include the turret-valve board, water glasses, water column and gauge cocks, steam and air gauges, hydrostatic lubricator, sander valve, pneumatic fire door, the stoker gauge and the stoker manifold, and control valves. Behind the fire door is located a stoker fire pot. This is piped for operation by compressed air so that the effect of the manipulation of the control valves can be observed by the movement of streamers which are attached at the outlets of the firing nozzles.

A crown-sheet plug in the back head marks the horizontal projection of the highest point of the crown sheet where it can be compared with the bottom of the water glass and the bottom gauge cock. In a table at one side of the back head are set forth the standard differences in elevation between the crown sheet and the bottom gauge cock of all the locomotive classes on the Reading system.

Near the opposite end of the car an operating scale model of a Duplex stoker, including the boiler back head and cutaway top and sides of the firebox, is mounted on the floor. This model is also piped for operation by compressed air.

Opposite each other, against the sides of the car, are two large display boards. On one of these is a complete non-lifting injector, including the water connections to the tender and the tank valve, and a top-mounted double boiler check with stop valves. Other devices displayed on this board are a tender water-scoop valve and operating cylinder, steam-operated cylinder cocks, pneumatic sander equipment, and boiler blow-off cocks. The water-scoop equipment, the sander



A complete set of standard mountings are displayed on a dummy boiler head across one end of the car—Stoker manifold and fire door are operated by compressed air

and the cylinder cock are piped for operation by compressed air. On the panel across the car are mounted models of the several types of injectors in service on the Reading or Central of New Jersey locomotives, a double boiler check and a hydrostatic lubricator model. A dummy reverse lever on this panel has a scale graduated in per cent cut-off for each notch in the quadrant from the center to the forward corner.

Other devices and parts are displayed on shelves at slightly below window-sill height. These include several models of force-feed lubricators, a steam-heat regulating valve, double-seat gauge cocks, and various details of other appliances such as injector combining tubes, and parts of boiler check valves and blow-off cocks. There is a complete operating model of a speed recorder. There are scale models of a grease-lubricated driving box and of the types of front ends on Reading locomotives.

A small hand-operated model of a Walschaerts valve gear is arranged so that the effect of the various reverse-lever positions on the movement of the valve can be observed.

Some of the cutaway models are accompanied by operating diagrams in color. A number of such diagrams are also provided for other locomotive appliances for which there are no models. These include the superheater, the feedwater heater, and the exhaust-steam injector, and a boiler low-water alarm. Other material are available in the form of manufacturers' instruction sheets and booklets on the power reverse gear, feedwater heater, stokers, soot blowers, injectors, and flexible pipe joints. The diagrams and instruction sheets are displayed in frames about the walls of the car and the booklets are arranged upon a small table at one side of the car.

At the entrance end of the car are wardrobe and closet space. Against the inside end wall is an instructor's desk on one side and a desk for registration on the other. The car is not equipped for occupancy en route. Electric power for lighting and for operating the record player and projector is plugged in from an outside source, and compressed air is provided in the same way.

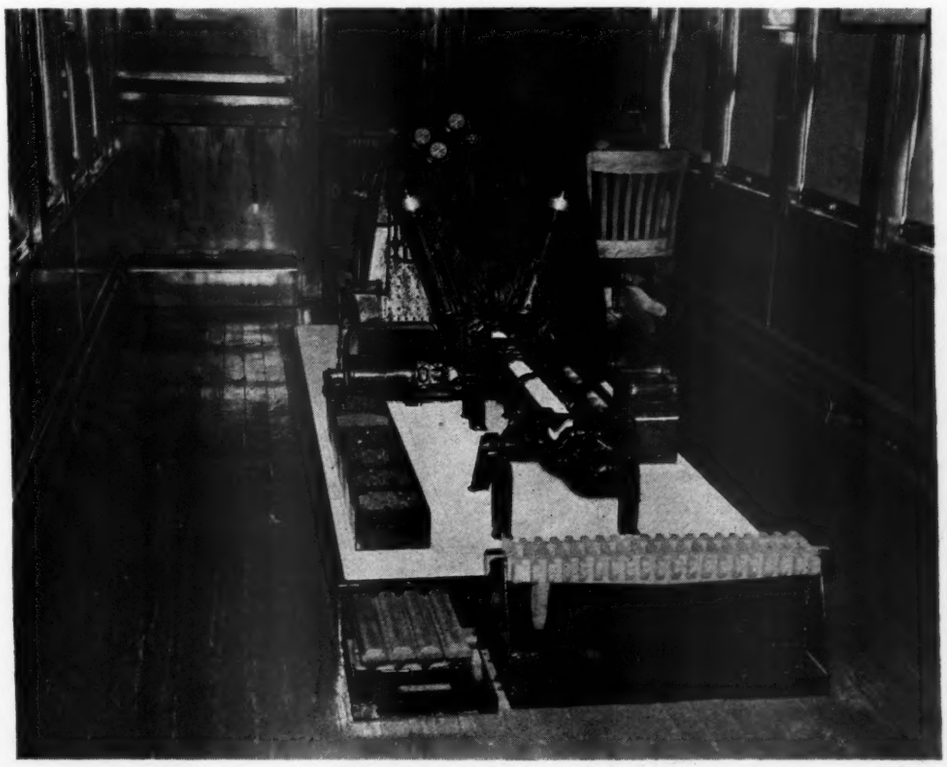
On Lecture Tour

On the present tour the car will visit all of the terminals of the system at which enginemen and firemen can be reached.

The program at each point provides regular class periods, including formal lectures, as well as informal discussions, time for questions and answers, and for the study and operation of the models by the men themselves. About one hour is required for the formal program. The lectures for this part of the program have been recorded and are delivered from double-face records by a phonograph with magnetic pick-up which forms part of the regular equipment of the car. It has a recording attachment.

The first lecture deals generally with locomotive operation, stressing the importance of economy in the use of fuel, and of safe practices, and emphasizing the need for the development of good judgment. This is followed by another short recorded lecture accompanied by slides, for which a projector and roller-type screen are provided. The screen is permanently installed just in front of the large boiler-head model at the end of the car. This lecture deals entirely with firing practice and is illustrated with a series of 18 colored slides. In the preparation of both of these lectures primary consideration has been given to the interests of the new men.

Following these two lectures the instructor in charge of the car calls attention to some of the more important devices on display, usually stressing some point per-



A scale model of the Duplex stoker—Grate bars and samples of coal mixtures used on the road are also included in this display

taining to their operation or methods of dealing with possible failures on the road with which experience has demonstrated that many enginemen are unfamiliar. This leads into a period of informal questions and answers on the part of some of the men, a few of whom may spend another hour or more if their own time and the schedule of classes permit.

During a general tour, such as the car is at present making, it spends from one to four or five days at a terminal, depending upon the number of enginemen employed. Attendance is not compulsory, and no special effort is made to get men to visit the car when reporting for duty or at the ends of their runs.

Experience so far indicates that better results are obtained by notifying men who are not on duty that the car is in town, where it is located, and the schedule of classes. Then the men who report at the car can spend the time for a regular class and additional time for studying the exhibits in which they are particularly interested. All men in attendance are requested to register. The most desirable class size is from 12 to 18 men.

While the equipment and instruction program are primarily intended to meet the needs of enginemen, shopmen are welcomed and encouraged to visit the car whenever they have an opportunity to do so. The instructors are prepared to call their attention to helpful information concerning some of the devices which will be of assistance in dismantling them or diagnosing troubles encountered with them. This is particularly useful in cases of equipment with which some of the men are only occasionally called upon to deal.

The Program Still Developing

With the completion of the current general instruction tour, it is proposed to use the car for a special instruction campaign to deal with the problem of tank heating during severe winter weather. The methods of operating tank heaters differ with various types of injectors in use on the Reading and Central of New Jersey locomotives. The result is that considerable confusion has developed in the minds of some of the men on whom dependence has to be placed to keep locomotives from freezing up.

Based on the attendance at the various points at which the new car has been stationed since it went into service, it is believed to have fully justified itself. Expressions of interest and approval on the part of the men who have attended the classes have been highly gratifying. At the present time preparations are being made for one further step which it is believed will increase the effectiveness of the time so spent by the men. This step is being taken in the belief that few men can listen to a speaker and retain clear impressions of more than a small part of what he has to say. A series of brief instruction sheets or pamphlets are being prepared for distribution to those who visit the car. Each of these will present the fundamental principles of operation of the various types of equipment involved in locomotive operation. It is the belief that supplementing the interest aroused by the lectures and the opportunity to study the working details of locomotive appliances with simple printed material which can be taken away from the car will add materially to the effectiveness of each.

Mechanical lubricators and front-end and driving-box models are displayed along this side of the car

EDITORIALS

Six Questions for Roundtable Discussion

The November issue of the *Railway Mechanical Engineer* will be devoted to "Conventions in Print" of the so-called Coordinated Mechanical Associations—the Railway Fuel and Traveling Engineers' Association, the Car Department Officers' Association, the Master Boilermakers' Association, and the Locomotive Maintenance Officers' Association. During the years preceding Pearl Harbor, these associations met each Autumn at one time and one place.

Last year these meetings were considered inadvisable. Each one of the four associations, however, had organized its committees and had laid out its year's work before the question of whether or not to hold its meeting had been finally decided. Each, therefore, went ahead with its year's work and completed its committee reports. These were printed in our November issue much as they would have been had the annual meetings of the associations been held, with the exception, of course, that there were no discussions. The reports were then published by the associations in their customary year books.

This year, even though there was no hope of holding their annual meetings, the Railway Fuel and Traveling Engineers' Association, the Master Boiler Makers' Association, and the Car Department Officers' Association organized committees which have proceeded with the preparation of their reports and these reports will again form the basis of "Conventions in Print" in our November issue.

The Locomotive Maintenance Officers' Association, in lieu of reports prepared by organized committees of the association, is sponsoring the Roundtable discussion in that issue. This discussion will deal with six questions; each pertains to a matter of direct interest to officers and supervisors having to do with locomotive maintenance. The questions are as follows:

1—Have you employed special training methods for supervisors and mechanics? What results have you obtained from these wartime measures? What features of this training do you think are suitable for your post-war training program?

2—Has any improvement been made in reducing the turning time of locomotives in your terminal in recent years? What facilities or methods have been responsible for this improvement?

3—What particular problems are giving you concern in the servicing and maintenance of Diesel locomotives? Have you found it necessary to provide special facilities and organization other than those required for steam locomotives? What?

4—Have you used flame hardening on locomotive parts? Has this process helped to solve material shortage problems?

5—What new applications of welding and cutting have you developed to meet the lack of materials and replacement parts? For instance, on driving boxes, crossheads, brackets, and to replace various small forgings and castings?

6—Which is better—boring, grinding or honing—such parts as air-brake pumps, feedwater-heater-pump cylinders, reverse-gear cylinders, etc.? Why?

Do you have pertinent information or experience related to any of these subjects which might be helpful to your contemporaries on other railroads? If so, write us a letter presenting your views or experience. Make it short and directly to the point. It should reach New York not later than October 15.

Grounded Wiring Systems For Diesel-Electric Locomotives

A one-wire system of electric wiring for steam locomotives is being used by the Norfolk & Western. This kind of wiring is essentially similar to that used on an automobile. A single wire carries the circuit through the switch to the headlight, the return being made through the metal of the locomotive. Similar one-wire circuits supply the other lights. The manner in which it is being done, with necessary modifications for the transition stage from a two- to a one-wire system, is described in the Electrical Section of this issue.

The simplified wiring will be applied to new locomotives being built and to existing locomotives that need rewiring. Since the I. C. C. requires an insulation resistance of one megohm on locomotives having cab signals, it will not be applied to locomotives so equipped.

The advantages of such a system are the simplification of the wiring and the saving of critical materials, namely, rubber and copper. With a two-wire system, it is possible to have a ground on one side without causing a failure, but it may also be argued that since there is only half as much wire, there is only half as much chance of a ground. Actually, grounds outside of junction boxes are usually caused by damage or deterioration, and either system is equally vulnerable to these causes. Aside from the saving of material and the advantage of simplicity, the one-wire system has proved to have a practical operating advantage of reliability. With a two-wire, non-grounded system, it is possible for a single ground to exist for a long time until a ground occurs on the opposite polarity. This makes two cases of trouble to run down and fix, whereas with the grounded system, wiring trouble will show up immediately when defects occur.

The practice of using a one-wire system is applied extensively to power circuits on electric locomotives. It is used on the 3,000-volt d. c. locomotives of the Chicago, Milwaukee, St. Paul & Pacific; on the 3,000-volt d. c. multiple-unit cars of the Delaware, Lackawanna & Western; on the 1,500-volt d. c. multiple-unit cars of the Illinois Central; on both 600-volt cars and locomotives of the Long Island on many suburban and subway cars, etc.

Some Diesel-electric locomotives have two-wire ungrounded wiring systems, others have two-wire grounded systems, while still others have single-wire power circuits with frame or ground return. There seems to be quite general agreement that two-wire ungrounded systems be used for control wiring, but there is no uniformity of practice for the power wiring.

The Land Transportation Committee of the American Institute of Electrical Engineers is at present studying this subject. There are many Diesel-electric locomotives being built and a general agreement on wiring practices would stop the extension of a chaotic condition. Expressions of opinion would help the work of the Committee. If there are those who feel that a single-wire power wiring system is inadequate or who can make other suggestions based on experience, they are offered the facility of these columns to explain their position.

Oil and Keep Machines Clean

The familiar instructions "Oil and Keep Machines Clean" were never more important to follow than at present. Possibly the order should be reversed, as no machine can be satisfactorily oiled until exposed bearing surfaces are first cleaned. The condition of shop machinery and tools, as noted by even a cursory examination, tells critical observers more than might be expected about the capacity of the machine operators and, in fact, the shop management itself. There may be some instances in which men, more or less careless about personal appearance and the cleanliness and good order of their machines and surroundings, do fairly satisfactory work, but, in general, the habit of mind which tolerates the use of dirty tools indicates a carelessness which is more than likely to be reflected in the products of those tools. Progressive shop managements realize that even old machine tools can and should be kept clean, but when it is possible to replace old tools with new up-to-date models, a powerful incentive is thereby given to operators to take proper care of these fine modern machines with which they earn a livelihood.

A number of machine-tool manufacturers have gone to the expense of issuing booklets explaining in detail the best methods of cleaning and lubricating their individual types of machines and, in general, these instructions should be closely followed. They point out that grit, scale and fine chips, if not brushed away, tend to mix with oil and form an abrasive sludge which increases friction and wear of V-ways, dovetails and other machine bearing surfaces.

The necessity of providing machine operators with suitable hand brushes and clean wiping cloths is apparent and, in this connection, air jets must be used with great caution, if at all, in removing dirt and small chips to avoid blowing this material into bearings and other inaccessible parts of machines where it will cause damage. The use of soft cord to clean lead screw threads, bent wire with V-shape ends to clean faceplate interior threads, bottle brushes for taper holes and various types of guards to catch the dust from tool-post grinders are excellent suggestions in one of the booklets now being distributed to machine users. The importance of adequate means for chip disposal, both on and around machine tools, is also stressed. Obviously, any time, within reason, spent to keep machine tools clean is a good investment in view of the increased machine life, higher production and greater ease of operation which result.

The same general statement can of course be made with respect to lubricating shop machinery. The primary purpose of lubrication is to minimize friction and extend service life by providing a film of oil which prevents metal-to-metal contact of the bearing surfaces. The use of correct grades of oil, as specified by the manufacturers, keeping all oil passages clear and well covered when necessary and developing in machine operators adequate and thorough oiling *habits* will be found most helpful by shop supervisors who take the trouble to look after such details.

Will We Use Plastics?

Elsewhere in this issue appears an article which is a general survey of the new field of plastics. Both as to chemical antecedents and physical properties, the field is broad and widely varied. While not all of the information concerning some of these materials needed to determine the full range of their possible usefulness is available, for many the information is fairly complete. An exhaustive treatment of the properties of all of these materials, many of which may be of relatively little interest on the railroads, has not been attempted. The article presents a general picture of the scope of the field and suggests sources of detail information. It will be evident to all who read the article that this is another field with which those concerned with design and construction must become familiar. Plastics offer many advantages as structural, electrical and decorative materials.

Metallurgy has long been a field in which designers and builders were at home; the study of plastic products and their qualities must now be added. It probably

will not be necessary for any of us to qualify as chemical engineers in order to understand what can be done with plastics; it will be necessary, however, to regard them as the new materials which they are. Plastics have many properties which cannot be compared readily to any of the materials which are more commonly known in the railway field. In any event, they should not be looked upon as substitute materials. Some can properly be termed alternates, others must be given consideration as entirely new, having properties and qualities which entitle them to a place in anyone's list of available materials. They are not substitutes.

It has been interesting to learn, through our Round-table and by contact with plastic manufacturers, that both the railroads and the manufacturers are waiting for the other side to say what is needed. Certain of the manufacturers are aware of the prospective railroad market but do not know just how to approach the field; with few exceptions the railroads have little understanding of what the manufacturers can do for them. In the post-war period we can expect that this condition will be corrected to some extent as manufacturers, now busy with war orders, seek new outlets and as railroads seek the best materials for use in the construction of new equipment.

It is probably incorrect to ask whether we will use plastics. For many years some plastic materials have been in extensive use for railroad applications. Many more of them will be available later and some understanding of what they really are and of what they can do will benefit railroad mechanical men. An attempt has been made to indicate their wide range of possibilities; studied acceptance and extension of their adoption on railroads is indicated. We will use them but a large gap in understanding must first be closed between the producers and railroad users.

New Machinery A Long-Time Guarantee

There are indications that the rather indifferent attitude of many railroads toward the replacement and modernization of shop equipment and machine tools used for locomotive and car repairs is finally bearing fruit in the inability of the older tools to deliver the goods under present conditions. Most railroads have not had any major tool replacement programs since the period between 1925 and 1930 with the result that the average age of machines in most shops is considerably beyond 25 years. Even before the war brought on the traffic demands of the past 20 months a 25-year-old machine tool had no place in a shop where accuracy and output are important factors.

In spite of the experience of industry with modern tools and tooling equipment many roads have been reluctant to discard machines which were still serviceable. On the other hand a few roads have been outstanding by their recognition of the capabilities of modern equipment and have profited thereby. Then came the war and with it a demand for motive power and cars beyond that which the railroad industry had ever before been called upon to meet. Immediately the source of new power and cars was practically closed and the competition of the armed services and the defense industries for basic materials and manpower placed a severe handicap on the ability of the shops to make general repairs to equipment. For the same reasons the modern shop equipment that might have eased the situation was almost impossible to secure because of unfavorable priorities. So, during the past 20 months particularly, the few roads which had been foresighted and had had regular programs of shop equipment modernization found themselves in the fortunate position of having a comfortable reserve of shop capacity while many of the other roads were forced to watch obsolete machines and tools waste man-hours at a time when man-hours were becoming increasingly more valuable.

Several months ago there were signs that the machine tool industry would shortly find itself with some excess producing capacity. There were also indications that the experiences of many roads under the pressure of forced operations had made them sufficiently conscious of the potential value of the new tools they did *not* have to create a desire for immediate replacement once the opportunity presented itself. A survey was made by this publication to discover the nature and extent of this pent-up demand for new shop equipment and if our interpretations are correct the railroad industry has, through experience, so thoroughly sold itself to the value of modern tools that programs involving the acquisition of several million dollars worth of new equipment are about to get under way.

The effect of high-speed, heavy-tonnage operation is reflected in the almost universal demand for that type of machinery used in the finishing of running gear parts —wheels, axles, bearings, rods. There was a time when the two-foot rule was looked upon as a measure of accuracy in railroad shop work. That day is gone. The introduction of such precision-built parts as roller bearings and the use of light-weight running gear parts is now seen as a governing factor in the need for machine tools capable of modern accuracy. This requirement plus the need for greater unit output to meet the growing manpower shortage completely overshadow the element of the peacetime requirement of production at low cost. Yet the new equipment, when installed, will assure low cost production of locomotive and car parts now and in the post-war period when competition will be the keenest.

It is to be hoped that the railroads will take advantage of their present opportunity to make known their requirements for shop equipment. There are two excellent reasons why action is desirable: to assure an adequate supply of motive power during the rest of the war period and to guarantee economical shop operations in the post-war period.

Roundtable:

How to Guard Against Low Water

Careful Maintenance Plus Thorough Training of Crew

First, we in the boiler building and repairing departments, must do the best possible job to keep the boiler and all its appurtenances in the best possible condition; keeping the boiler clean, free from scale and free from leaks; keeping gage cocks, water glasses and all water level indicators in first-class condition, equipped with proper lights and so located that the enginemen can, from their usual position in the cab, know just where and how much water they have. Pumps and injectors and feedwater heaters and all valves used in their operation must be maintained in prime condition.

Enginemen should have proper instructions from some official in whom they have confidence as to his knowledge and experience in the building and maintenance of boilers, and who can stress the importance of carrying a proper level of water in the boiler, and train them not to depend entirely on appurtenances that are designed to prevent low water, since these devices are not infallible in all cases and do occasionally become inoperative. Enginemen should be trained to extinguish the fire at once when low water is discovered, because the intense heat of the fire on the uncovered crown sheet softens the steel so rapidly that it can no longer withstand the pressure of the steam and the explosion is the logical result.

Enginemen should remember that after the water in a boiler lowers to the level of the highest part of the crown sheet, its level falls very fast because of the construction of the boiler. Bad water and foaming boilers are a prolific cause of boiler explosions. Proper water treatment and proper washing of boilers will do a lot to prevent explosions from this cause. It is impossible to tell the true level of water in a boiler that is foaming or dirty, because of the erratic action of the water when the engine is working.

The supervisor in charge of training engine crews to guard against and prevent low water, and to take correct measures to prevent an explosion when low water is discovered, should know boiler construction thoroughly and be familiar with all appurtenances used to supply water to the boiler. He should know the effect of heat on steel and approximately the degree of heat developed in the firebox when the boiler is worked to capacity. He can then explain correctly to engine crews the effect of low water on the crown sheet and the short length of time required after water disappears from sight in the water glass to fall below the highest point of the crown sheet. The softening of the sheet from the heat generated in the firebox can only lead to one conclusion—a burned crown sheet or an explosion.—*D. P. Smith, Boiler Foreman, C. B. & Q., West Burlington, Iowa.*

Boilermaker Foreman Gives Views on Boiler Explosions

Locomotive boiler explosions are caused primarily because at the time of the explosion some part of the boiler is too weak to withstand the pressure to which it is subjected. From a boilermaker's viewpoint, the weakness resulting in failure is caused almost entirely by one condition, i. e., low water. The boilermaker, being familiar with the function of every brace, staybolt and rivet entering into the construction of a boiler, knows that normally the structure is amply strong to withstand four or five times the load placed upon it. He also knows the narrow margin between perfectly safe operation and appalling disaster, if for any reason the crown sheet is allowed to become overheated due to low water.

It is evident from conversation with enginemen, shopmen and other railroaders that the causes of boiler explosions, and the reason for the violence resulting from such explosions is not generally known. Various theories as to excessive pressure being built up in the boiler, water flowing back onto a momentarily uncovered firebox sheet, dynamite in the coal, etc., are often advanced after an explosion has taken place. The true explanation is, of course, quite simple when understood.

The flames and hot gases in a locomotive firebox at a temperature of from 1500 deg. to 2500 deg. F. heat the firebox sheets which, while covered by water, remain at about the temperature of the water. This temperature is dependent on the steam pressure in the boiler, and is in the neighborhood of 400 deg. F. If, however, sufficient water is not at all times present to keep the firebox sheets at the proper temperature, the sheets become overheated. Firebox steel when heated becomes slightly stronger until about 500 deg. F. is reached, after which the strength falls off very rapidly until at 1600 deg. F. the steel has lost about 85 per cent of its strength at normal temperatures.

At some stage during this overheating the strength of some part of the boiler, usually the crown sheet, becomes less than that required to withstand the load of steam pressure, and rupture occurs. The force of the resulting explosion is in proportion to the size and suddenness of the rupture, and the temperature and amount of water in the boiler. At the instant the steam is released from the boiler the water in the boiler flashes into steam until a heat balance is effected. This steam, generated so instantaneously, occupies a space vastly greater than that occupied by the water in the boiler—perhaps 1500 or 2000 times as great. The terrific rush of the steam to occupy this greater space often tears the boiler off the locomotive frame, and results in the rocket-like behavior of the boiler.

It is felt that not all enginemen are aware of the small amount of time available to them to remedy the situation when, for any reason, water is out of sight in the glass. A modern locomotive boiler contains somewhere in the neighborhood of 6000 gallons, or about 50,000 lb. of water. Normally the lowest reading of the water glass is 4½ inches above the top of crown sheet. At the instant water ceases to be seen in the glass there are approximately 720 gallons, or 6,000 lb., of water available for evaporation in a large boiler before the highest point of the crown is uncovered. The modern locomotive boiler evaporates somewhere near 80,000 lb. of water per hour when working at capacity. The time available for the engine crew to make any move calculated to overcome the difficulty resulting in low water is therefore limited to something like five minutes, more or less, depending upon whether the engine is on level track or a grade, and how hard it is working.

It is not within the boilermaker's province to tell the enginemen what to do in the event that the water supply fails for any reason, but he can attempt to impress upon them the absolute necessity for quick action to prevent the crown sheet from becoming overheated to the point where its strength is unequal to the load imposed upon it by the steam pressure. The railroad with which the writer is connected has for sometime past conducted an educational campaign in writing and by word of mouth, calling the enginemen's attention to the absolute necessity of knowing the water level in the boiler at all times. A typical bulletin, addressed "To Enginemen," follows:

EDUCATIONAL NOTICE No. 215

"Recently there were two locomotive boiler explosions which resulted in the loss of several lives, as well as large property damage.

"The first of these explosions occurred on a freight engine at which time both the engineer and fireman were killed and the brakeman, who was in the brakeman's house on the rear of the tender, was seriously injured. The tonnage of the train consisted of slightly less than 400 tons of the tonnage rating of that particular class of engine at the time of the accident.

"The report by the Interstate Commerce Commission covering this accident shows that for a period of 30 days prior to the

and Prevent Locomotive Failures

accident the water in the boiler of this engine was reported by engineers to be changed 19 times and that during this same period the boiler had been washed 3 times and the water in the boiler changed 19 times. It was not known whether or not the blow-off cocks had been used from the time of departure from the terminal until time of accident. The report further states that nothing else was found during this period which would have any bearing on this accident.

"The second explosion occurred on a passenger engine while standing for several minutes after it had pulled away from the station. This train had gone 16 miles from its terminal when the first stop was made and after moving a short distance it again stopped and the findings of the Interstate Commerce Commission show that the conductor of the train walked up to the engine and inquired of the engineer, who was then on the ground working on the injector, the reason for the stop and was informed by the engineer that they had trouble with the injector and that they had to get some water in the boiler or else wait for another engine. The report also shows that the fireman was walking away from the engine and he told a section laborer that the engine was going to blow up as there was no water in the boiler. However, shortly before the boiler did blow up this same section laborer saw the fireman turn around and walk back toward the engine. The result of this explosion was that both the engineer and fireman were killed and, of course, the locomotive seriously damaged. The Interstate Commerce Commission's report shows that the daily inspection reports for a period of 30 days prior to the accident did not show anything which would have had a bearing on the accident.

"I am calling these two cases to your attention for the particular reason, as Mr. Bjorkholm and myself have stated many times through the medium of these Notices, 'Do not take chances with water in boiler as you are playing with dynamite if you do.' Mr. Bjorkholm has said to you, and I am in perfect agreement, that if you do have trouble maintaining a safe water level in boiler and have to kill the engine to save damage, we will take your part.

"In this connection I might say that all of our non-lifting injectors are equipped with a tell-tale pipe, its purpose being to warn the enginemen in case the injector breaks. It is very important for you to know that this pipe is open. This can be determined by blowing the steam back through the injector and noting steam discharging from the end of tell-tale pipe which is located at boiler head in cab. This is particularly important in freezing weather. In case you find the tell-tale pipe stopped up be sure and report same on Form 602.—R. C. Hempstead, Asst. Supt. Motive Power."

Enginemen should know that playing with low water is playing with dynamite. It is vitally important at all times that safe operating conditions prevail. At a time like the present when both manpower and equipment are irreplaceable, no effort should be spared to insure that everyone charged with the care and operation of locomotive boilers be properly instructed in regard to low water, and what action to take should this unfortunate condition occur.—*Edward H. Heidel, Boiler Foreman, C. M., St. P. & P. Locomotive Shops, Milwaukee, Wis.*

Operating Suggestions

I believe the items listed below will overcome low water in locomotives and eliminate accidents.

Prior to leaving the engine terminal the engineman must fill out a form showing the condition of the firebox; he must know that water glasses and cocks, as well as the water column, are in working condition; he must know that the injectors and the feedwater system are operating and in good condition. The engineman must report any defects to the terminal foreman in charge for correction. If O. K., he, the engineman, must sign the form which holds him responsible. If the locomotive is operated in extensive service a form should be made out by each engineman in charge, and the form turned in by the engineman at the last terminal.

It must be impressed on the mind of the engineman that he must try the gage cocks frequently en route to know the actual amount of water in the boiler and not depend on the water glasses. Regardless whether the fireman or the engineman is operating the injectors or feedwater pump, the proper amount of water should be around two gages. This will insure a safe margin if there is any trouble with injectors or feedwater system ascending or descending grades, thus avoiding any wash ahead or back in the boiler, exposing the sheet or flues. It is a bad practice for the engine crews to give away water to a low point when locomotive is not steaming. This practice can be stopped by the road foreman of engines and traveling firemen when riding locomotives and must be called to the attention of the engine crew.

Care should be used in starting the locomotive to avoid a heavy wide open throttle when the water has been chemically treated; if not, there is a liability of engine working water, raising it in the water glass, but at the same time reducing it rapidly and too low in the boiler.

It might be well to post a picture or print of a damaged boiler on the bulletin board, where it will be noticed by the engine crews prior to leaving; this will impress them with the results of low water. It would not be necessary to show any names of the men or the railroad.

All locomotives should be equipped with some low water alarm or device.—*A. T. Pfeiffer, Syracuse, N. Y.*

It Can Be Done!

Boiler explosions (98% of the crown sheet failures are due to low water) are an embarrassment to railroads, an impediment to the war effort, and a source of loss in both life and property that is causing grave concern to those considered responsible; also to the public at large which naturally believes that something should be done about it and done quickly.

Water registering devices on American locomotives—low water alarms and other safety devices—are the best in the world. Our locomotive boilers themselves are built and maintained to and above Federal requirements; hence it is evident that the cause lies elsewhere. In a majority of cases the only ones who really know, or could help determine causes, are victims of such explosions. It would appear that engine crews become lethargic to danger signals—get "used to" the point of danger —until it is too late.

What can be done to help these otherwise capable employees? What suggests itself as a reliable check and safeguard to avoid such failures and ensuing injuries and property damage? Whoever can project such an idea, method or device will make a real contribution to humanity in general and to American railroads and their employees in particular, as boiler explosions are an unnecessary evil that can be eliminated if all concerned bend every effort to that end.

Old timers will recall some of the conditions we were called on to correct prior to July 1, 1922, and records show that these really were corrected to a minimum. It still remains to correct one of the most serious of all—low water crown sheet failures—and this must be done quickly. Railroad men should pool their experience and interests to that end—men in the shops and roundhouses, boilermakers, machinists and others, who have spent their working lives inspecting, repairing and supervising work on locomotive boilers and accessories, including water registering devices and alarms (safety or drop plugs)—being certain nothing is overlooked. And in your daily contacts with enginemen, seek their

confidence and impress on these knights of the road the functioning and importance of water alarm devices. Help them as never before and in your own efforts go beyond the "call of duty" to help your employer correct this evil that is taking such an unnecessary toll in life and property. To overcome such *now* is to make a patriotic and permanent contribution to humanity, to your employer and to the good old U. S. A. *It can be done.—William N. Moore, General Boiler Foreman, Pere Marquette, Grand Rapids, Mich.*

Boiler Drop Plugs Effective

This subject has been and is a live one on this railroad, due to water and grade conditions. We use boiler drop plugs on the Southern Pacific and believe, with the experience that we have had with them, that they are one of the best devices known for prevention of damage to boilers due to low water. In eleven years we have had 210 proved cases of low water, and were provided with complete protection against explosions in all but a single instance. Last year we experienced an all-time high in low water hazard of accidents, this increase being due to new and inexperienced enginemen, fire builders and engine watchmen.

The crown sheet on the Southern Pacific power is protected by from four to thirteen drop plugs, depending on the size of the firebox.

Instructions concerning the operation and handling of these drop plugs are framed and posted prominently in each locomotive cab and in the enginemen's and register rooms. One of these notices is shown in the illustration.

The best preventives against boiler explosions are:

An efficient and careful engine crew, fire builders and engine watchmen.

Boiler drop plugs spaced properly.

Water glasses and gage cocks that are known to be registering properly, and the fact fully realized that a full water glass is to be suspected as well as an empty one.

The importance of these factors should continually be emphasized by supervisors and others, and when this is done, the number of explosions each year will be materially decreased.—*R. N. Booker, General Road Foreman of Engines, So. Pac.*

Training of Engine Crew

This roundtable discussion, as the writer takes it, is an effort to reach the human element which enters directly into most unfortunate locomotive boiler explosions, regardless of the fact that many times, due to the members of the crew all losing their lives, the cause is placed on some faulty operating device, which would not have been dangerous at all, had proper steps been taken by the engine crew to make an examination or kill the fire while there was still enough water on the crown sheet.

Here are several of the questions and key answers used in our examination for promotion from fireman to the position of engineer which relate to boiler feeding and management by the crews in charge. The supervisor is required to see that all candidates understand their meaning at the time of the oral examination before they are passed as capable of taking charge of engines.

Q.—Do you understand that it is your duty and responsibility, upon taking charge of a locomotive, before each trip, or day's work, to examine the firebox and crown sheet and see that they are in proper condition? A.—Yes.

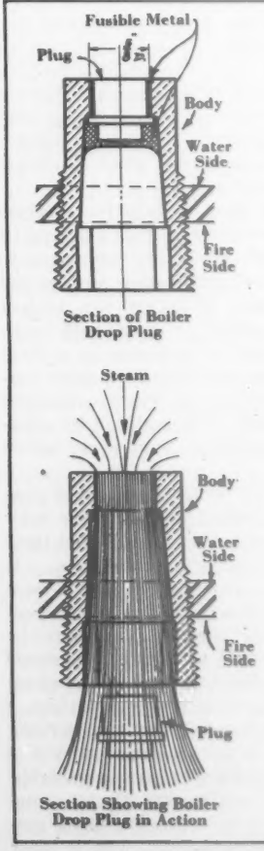
Q.—What means have you of determining the height of water in boiler?

A.—The gage cocks and water glass.

Q.—Do you understand that it is your duty and responsibility, before each trip or day's work, to blow out all water columns, water glasses, and test all gage cocks and to know that they are in proper condition, and that the gage cocks can be easily opened and closed by hand without the aid of a wrench or other tool?

A.—Yes.

Q.—Do you understand that it is your duty and responsibility before each trip, or day's work, to know that all tubular water glasses and lubricator glasses are equipped with a safe and suitable shield,



NOTICE

All locomotive boilers are equipped with multiple application of BOILER DROP PLUGS for protection in case of LOW WATER

Boiler Drop Plug consists of a brass body into which is secured a brass plug held in place in the body by a ring of fusible metal which will soften or melt at a temperature between 550° F. and 575° F. The Drop Plugs are applied in the crown sheet of fire box, the number applied being in proportion to the size of the boiler. The Drop Plugs project above crown sheet and are covered with water when carried at proper level. With LOW WATER the Drop Plugs become uncovered, permitting the temperature of the Drop Plugs to rise to over 550° F.; this temperature will soften the fusible metal and the pressure in the boiler will eject the plugs, permitting steam to escape into the fire box.

The fusible metal is carefully alloyed and tested to insure proper melting point before being used in the manufacture of Drop Plugs and every lot of Drop Plugs is further tested to insure proper functioning temperature before being released for use in locomotives.

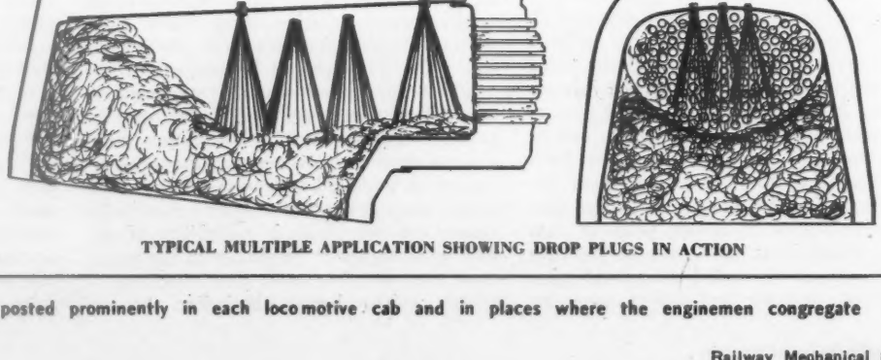
Account of size of boilers and the distance Drop Plugs are located from the fire door, they may not always be heard when they go into action, but the effect on the fire should easily be observed and any sudden change in the condition of the fire should be immediately investigated to see that the water is at the proper level in the water glass and gage cocks. If the water is found to be at an unsafe level, FIRE SHOULD BE IMMEDIATELY PUT OUT and examination made through fire door to determine if Drop Plugs have functioned. If Drop Plugs have not functioned water must be FIRST restored to proper level in boiler and THEREAFTER fire may be relighted.

WHAT TO DO WHEN BOILER DROP PLUGS FUNCTION

1. PUT FIRE OUT. CLOSE FUEL OIL VALVE OR SHUT OFF COAL SUPPLY. Do not operate injector or feedwater heater, and leave water and gage cocks in the condition existing when Drop Plugs functioned. Leave fire door closed.
2. On engines, if train being handled and if helper power or power from other trains is available, main track should be cleared and engine and train secured from moving. On light engines handle as instructed above and take any other action necessary to insure safety. Make telephone and wire report immediately to Superintendent, Chief Dispatcher and Master Mechanic and await instructions.

San Francisco, April 17, 1943.

SOUTHERN PACIFIC COMPANY



TYPICAL MULTIPLE APPLICATION SHOWING DROP PLUGS IN ACTION

Notices similar to this are posted prominently in each locomotive cab and in places where the enginemen congregate

which will prevent the glass from flying in case of breakage, and that such shield is in a proper condition? A.—Yes.

Q.—Do you understand that it is your duty and responsibility before each trip, or day's work, to know that all water glasses are supplied with a suitable lamp properly located, to enable the engineer to easily see the water in the glass?

A.—Yes.

Q.—Do you understand the proper method of blowing out a water glass to insure one that is registering properly and that this is the way an engineer must prove to himself that the water glass connections are free from any obstruction? Explain how this should be done.

A.—1. Close the bottom water glass valve.

2. Open the drain valve at bottom of water glass connection, blowing out water glass and drain valve thoroughly.

3. Close top water glass valve.

4. Open bottom water glass valve, blowing this valve out thoroughly.

5. Close drain cock at bottom water glass connection.

6. Open top water glass valve.

Q.—Do you understand that it is your duty and responsibility to compare the water level in the water glass with gage cocks frequently while on the road and while standing at terminals, and not depend entirely on the water glass?

A.—Yes.

Q.—Should the water in the boiler become disturbed and foam, what should you do, and how would you ascertain whether it was foaming or becoming overpumped?

A.—Would relieve the condition as quickly as possible by the repeated use of all manual blow-off cocks to the extent that water level in boiler will permit. Locomotive throttle should be eased off and cylinder cocks opened while the carry over is taking place. Water level indication in water glass, together with the trying or opening of all gage cocks, will determine whether the boiler water is disturbed or overpumped to a point of too high a water level.

Q.—What effect does shutting off the throttle have on the water in the boiler?

A.—It tends to lower its level.

Q.—What is important in carrying water in the boiler as to height and regularity?

A.—The boiler feeding should be consistent and uniform so that a constant level will be maintained. This is to be at a point high enough to protect the boiler and firebox sheets under all operating conditions ,and yet low enough to insure the working of dry steam and obtaining maximum superheat temperatures at all times.

Q.—What is an engineman's principal duty in regard to the care of the boiler?

A.—See that firing and pumping are handled at all times in a manner which will avoid any sudden or wide variations in steam pressure; such changes cause cracks, broken bolts, leaks, etc., due to the resultant rapid expansion and contraction.

Q.—Why is it necessary to pay strict attention to the blowing off point of the safety valve and make comparison with steam gage?

A.—In order to know that safety valves are functioning properly at the required setting and preventing the build-up of any excess pressure in the boiler.

Q.—What would occur if sufficient water was not kept on the crown sheet?

A.—Damage to sheet would result immediately, followed by the possibility of injury to the members of the engine crew.

Q.—How is the strength of iron and steel affected by being heated to red heat?

A.—It is weakened very quickly and the metal becomes soft.

Q.—Since the heat has this effect upon steel, how is it that the firebox and sheets, which are quite thin and are subjected to a high temperature and a high steam pressure per sq. in., can withstand such pressure without being either torn or deformed?

A.—There is water on the side of sheets opposite to that which is subjected to the heat. Heat is absorbed by the water.

Q.—Should a blowoff cock stick open or be broken off, or a hole be broken in the boiler in any way, what would you do?

A.—With blowoff cock stuck open, put on second injector to protect water level in boiler, and if necessary ease down or shut off throttle; after steam pressure is lowered it may be possible to close it; if not, it will be necessary to stop and close the globe valve in the blowoff cock waste pipe, if so equipped. In case of blowoff cock broken off at side sheet, washout plug blown out or hole in boiler, protect the firebox sheets by use of second injector, while dumping or hilling fire. If possible, allow train to drift into a siding.

Q.—In case a boiler tube should burst on trip, what would you do?

A.—It would depend on the location of the flue and how badly burst. In certain cases, if it is a lower flue, it may be possible to cover with green coal, and the same may apply on a locomotive equipped with fire arch with a flue in a similar location, thus making it possible to come to terminal with at least reduced tonnage. If in a location bad enough to put out fire, try to clear the main road before giving up, and notify superintendent.

Q.—What action should be taken in such a case, provided it is necessary to draw the fire?

A.—Try to clear main road before drawing fire; prepare locomotive to be towed, including lubrication of moving parts. During freezing weather it will also be necessary to drain boiler, water cistern, water pumps, injectors, feed and delivery pipes, hydro, lubricators, etc. Should the rods be left up some provision will have to be made for the rider or man in charge to warm up the mechanical lubricator; this will protect it from damage and insure lubrication to cylinders. This can usually be done by securing a supply of burlap and wrapping a piece around the lubricator occasionally and setting on fire. Should driving connection to the mechanical lubricator be broken beyond repair it will be necessary to warm some valve oil and then remove port plugs frequently, to pour oil into valve chambers; if followed up and perhaps supported with some rod cup grease enough lubrication will be assured to protect valves and cylinders while coming to a terminal. In case lubrication cannot be provided it will be necessary to take down the main rods and clamp valve control; also block crossheads securely.

Q.—Should the water in the boiler get too low to allow you time for examination, what would you do?

A.—Take immediate action to protect the crown sheet and other firebox sheets by dumping or smothering fire; this will depend on the conditions.

Q.—In case of failure of water supply in tank, or tank valve becoming disconnected in tank, what would you do?

A.—It may be possible to run locomotive light to a water station, provided the distance is short, before water in boiler is exhausted or becomes too low to allow for refilling; or it may be possible to cover over or deaden fire and be towed to a water station in the event that another engine is available. However, conditions may be such that the fire will have to be drawn or dumped at once in order to protect the firebox sheets from being burned. If near a siding try to get train off main road, if possible. Should a tank valve become disconnected in closed position, use the other injector or water pump to terminal, as case may be, working the locomotive to the extent that will allow the remaining device to meet the boiler requirements for the remainder of the trip. It may be necessary to drain the cistern while standing at the water station, after which the cistern can be entered through the filling hole and tank valve stem connected up and valve opened. The cistern can be refilled before proceeding.

Road supervisors follow this up when riding engines or talking to the men, in an effort to keep them conscious of all of the factors, from the simplest, such as regular trying of gage cocks, to that of boiler requirements per minute under full load operation of locomotive. Also why it is essential to ease off or shut off at once, provided devices are not maintaining a safe running water level; how many gallons per inch various boilers contain at the region of the water glass; how many inches there are on the crown sheet when water level is at the lowest reading, etc. This is to make the men conscious of the fact that something has to be done at once when water starts falling to a dangerous level and that something, which is something other than to continue to work the engine, *has to be done right then,* regardless of the delay which it may cause.

To the writer there is nothing dangerous in being on an engine when one or both of the boiler feed devices lag or fail to work, provided the engine is eased off or shut off at once. With the boiler water at or near running level, there will be enough after the throttle is shut off to allow for a short inspection and perhaps to correct the trouble. *One full gage* is as good as a boiler full for this purpose. Should the examination fail to give results, the fire can be covered over or dumped as conditions warrant. If the crew continues to work the engine and keep the fire in the usual condition, the result is pretty sure to be a fatal explosion in the matter of a few short moments.—*Road Foreman of Engines.*

Santa Fe Diesel Shop Kinks

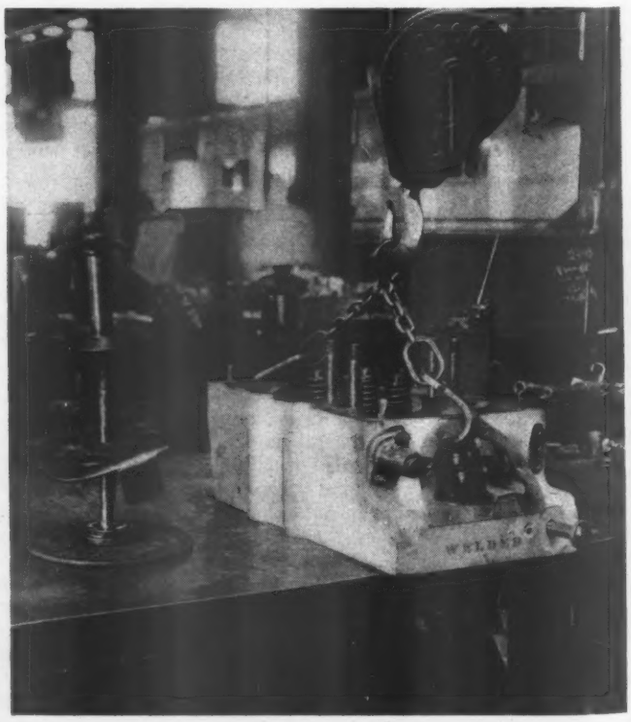
At the Eighteenth street, Chicago, Diesel locomotive repair shop of the Atchison, Topeka & Santa Fe, which was described in the *Railway Mechanical Engineer* of January, 1941, all classes of repairs, including light, medium and heavy, are made to Diesel electric locomotives. The Santa Fe has 11 Diesel passenger locomotives and 10 Diesel switchers operating out of the Chicago terminal and 3 of the road locomotives have been given heavy repairs within the last few months after having made about 1½ million miles of service each. The normal output of the Diesel locomotive shop, with a total force of 86 men,* is about one heavy, two medium and 96 running repairs a month.

Pit view of a road locomotive entering the Santa Fe Diesel shop at Chicago

In addition to well-arranged inspection pits, Whiting hoist and overhead crane facilities for lifting locomotives, Diesel engines and other heavy parts, also for handling trucks and wheel work, one of the important features of this shop is the large number of ingenious tools and devices which are used to expedite the various repair operations. For example, one of the illustrations shows a Diesel engine cylinder head which has just been lifted from the floor to the work bench using a jib crane with special double-chain and hook device attached to the crane hook. One of the double chains (at the rear) is attached to a plate-type hook equipped with two lugs which engage the stud holes for water passages at the top of the head. The front hook simply is placed in the injector bell-crank-cover hole. With this type of lifting device, it is obvious that the cylinder head is held safely in a horizontal position and that there is no chance of slipping. The lifting hooks are both easily applied and removed.

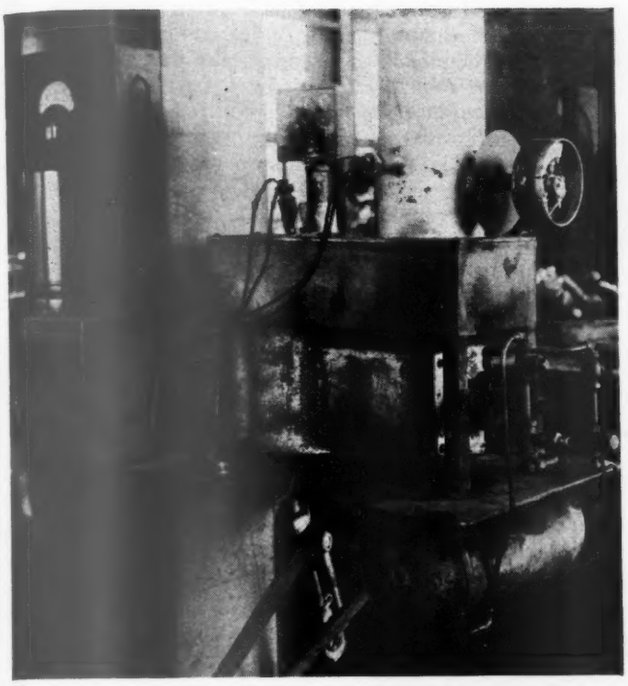
At the left of the head in the same illustration is shown a simple valve-spring-compressing device which greatly facilitates removing and applying the exhaust valves. This device consists of a circular bottom plate large enough to cover all four valve heads, a ⅞-in. bolt being welded to the center and carrying a special top plate which engaged the spring followers with a nut and hand-operated socket wrench on the upper end of the bolt for tightening purposes. The top plate, made of thin sheet steel to the shape shown has four holes large enough to go over the valve stems and also has a small hole at each back corner to fit over the rocker-arm studs as a guide. The lip on the front of the top plate is used to keep the top plate horizontal and thus assure compressing all springs equally.

In operation, this valve-spring compressing device is applied to the valve head with the center bolt extending through the injector hole in the head, the bottom plate covering all four valves and the special top plate engaging the spring followers. Operation of the hand wrench then tightens the top plate, compressing the springs and pushing the spring followers down over the locks which can then be removed. Backing off the nut then releases



Cylinder head lifting and valve removing devices

* Includes 3 supervisors, 2 clerks, 26 mechanics, 4 apprentices, 26 helpers and 25 laborers.

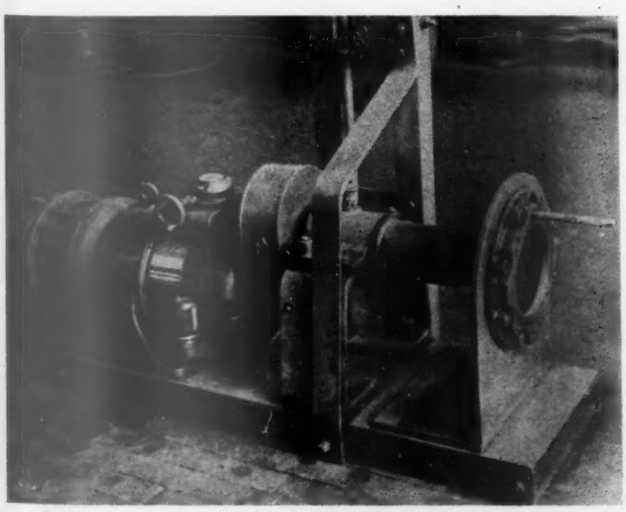


Device for testing steam temperature and stack switches

the springs and permits all four valves to be removed at one time. The reverse operation is used in reapplying new or reconditioned valves.

The next illustration shows special equipment supplied by the Vapor Car Heating Company and mounted conveniently on a building column for testing steam temperature and stack switches used in Diesel locomotive steam generators. This device consists of an atomizer with fuel-oil connection to the 2-gal. tank underneath the device and an air connection to the shop air line. The atomized fuel and air are sprayed into a combustion chamber, as illustrated, where intense heat is generated. Over this chamber is a sheet-metal housing which contains a lead pot in which the lower end of the steam temperature switch is emersed for checking. In the lead pot is an Alnor pyrometer element with an electrical connection to a temperature-indicating meter mounted on the post at the left.

Above the lead pot is a flue which leads to the 6-in. stack, 14 in. high, illustrated. In the side of this stack (at the right) is a hole for insertion of the stack switch as shown in the illustration. Another Alnor pyrometer element is inserted through the front of the stack with electric connections to the indicating meter to give an accurate reading of temperatures at which the stack switch operates. This device proves its value in checking steam temperature and stack switches which must be maintained within pre-determined close limits for satisfactory operation of the steam generator.

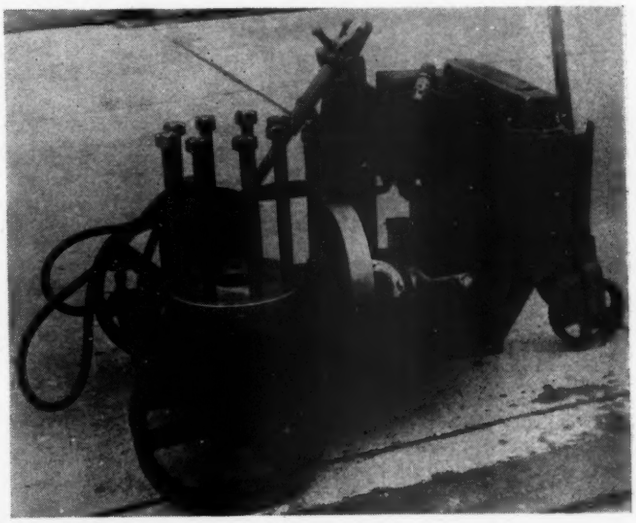


Variable speed device for testing speed indicators and train control governors

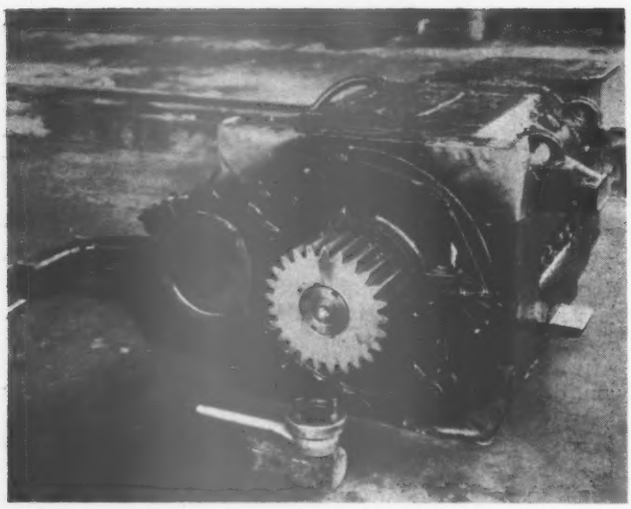
Another illustration shows a variable-speed device which is used in testing all types of speed-indicating devices for Diesel locomotives and train-control governors. This special testing equipment consists of a New Departure Transitorque infinitely-variable-speed transmission, driven by a 5-hp. induction motor and geared to a shaft which fits the drive of the electric speed-control governors. Adapters are provided for different types of electric or pneumatic speed control governors, the actual speed being checked by a hand tachometer. A lamp bank on the frame of the device is supplied by a small transformer, with a receptable where the governor contact plug is connected so that opening and closing points of all contactors are indicated.

Removing Motor Pinion Gears

A device, supplied by the Electro-Motive Corporation and mounted by the Santa Fe shop forces on a three-wheel truck, can be conveniently moved about the Diesel shop and used, as shown in the next three illustrations, for removing and reapplying traction-motor pinion gears. Referring to the general view of this device, an induction heating element will be seen at the right with a hand-operated hydraulic pump at the center and a hydaulic ram and stud gear puller placed at the rear. This pinion is a taper fit on the motor armature shaft and the first operation in removing a worn pinion is to unscrew the end nut with a special wrench. This wrench, shown resting on a small block of wood under the pinion in one of the views, has four hard steel lugs which fit into corresponding rectangular holes in the periphery of the pinion nut. The use of the pinion nut wrench, with a plate extension handle as long as may be necessary, enables the pinion nut to be backed off without any particular difficulty, the pinion being held against turning by means of a small metal block placed between the teeth and a steel block support on the motor housing.



Special equipment used in removing traction motor pinion gears

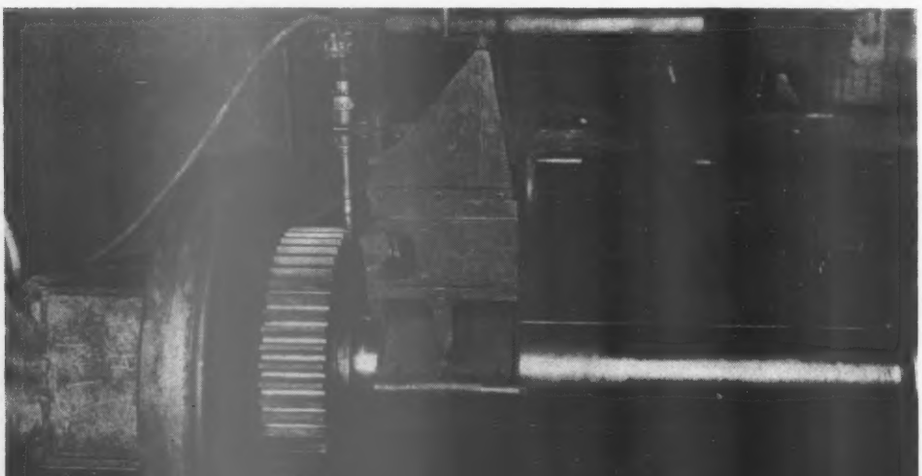


Special wrench used in removing the pinion end nut from motor shafts

position as illustrated. The passage of electric current through the induction heater under control of the switch illustrated then induces a magnetic flux through the laminated bar which serves to heat the pinion uniformly to just the right temperature required for the shrink fit on the armature shaft. In the particular motor illustrated the shrink fit of the pinion on the shaft is such that an advance of .055 in. to .065 in. gives the desired fit. This enlargement of the pinion shaft diameter can be secured with a temperature differential of about 130 deg. C. between the pinion and the shaft, the exact temperature being measured by a portable pyrometer which indicates to the operator just when to shut off the induction heater thus avoiding any possibility of overheating the pinion. After the pinion is applied and the pinion nut tightened, using the special wrench, this part of motor traction reconditioning is complete.

A Pinion Gear Tooth Grinder

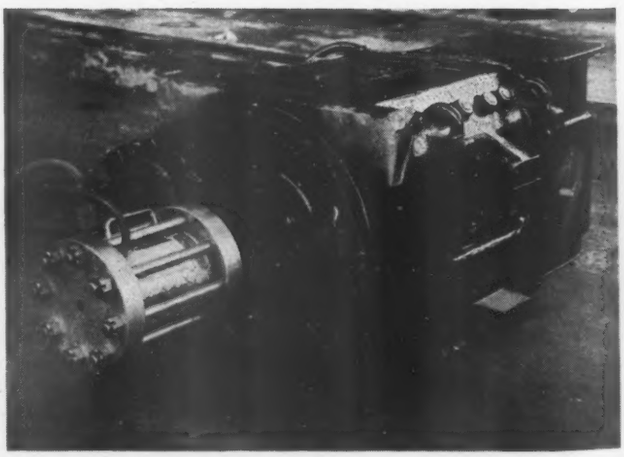
Traction motors in railway service are subject to unusually heavy duty and wear between the motor pinions and gears mounted on the driving axles is unavoidable. In maintaining the power trucks of Diesel locomotives, it is the practice of the Santa Fe to keep pinion



A portable grinder used in restoring worn tooth contours to standard

On removal of the pinion nut, the base plate of the gear puller is applied by turning its threaded extension end into the internal threads in the pinion. The cylindrical hydraulic ram, which is readily lifted by means of a small handle, is then applied within the studs of the gear-pulling device together with a small cylindrical spacer block and the circular end plate held by eight nuts as shown in another view. As set up, therefore, this gear-pulling device is rigidly connected to the pinion gear and the piston of the hydraulic ram bears against the end of the armature shaft through a hole in the base of the gear puller, the small spacer block transmitting pressure from hydraulic ram to the motor armature shaft. Operation of the hand operated hydraulic pump on the three-wheel truck therefore transmits as much pressure as required through the hose connection to the hydraulic ram to force the pinion off its shaft.

When ready to re-apply a new or reconditioned pinion, it is first set by hand on the motor armature shaft and its position checked with a special micrometer depth gage. It is then removed and placed on the heavy laminated iron bar of the induction heater mounted on the three-wheel truck, as shown in a separate illustration. This laminated bar is lifted out of place for application of the pinion and is then easily replaced in working



Gear puller in place ready to remove the pinion gear by hydraulic pressure

and gear sets together in the interest of smooth, quiet operation, and to avoid throwing excessive stress on gear teeth as would be the case, for example, in running a new pinion with a worn gear. As soon as the motor pinions and gears on Santa Fe Diesel locomotives show any appreciable wear, the tooth grinder, illustrated in one of the views, is used to bring the contour of the teeth back to the original by means of a slight grinding operation on each tooth. This does not change the tooth spacing in any way, but does give a slightly increased back lash, which is not objectionable.

The device used for this grinding operation consists of a compound rest, with slides in three directions, mounted on a V-fitting with a hinged plate clamp which can be readily applied around the axle inside the gear. On one of the compound rests is a fitting which holds a Chicago Pneumatic high-speed air motor which drives a small wheel, dressed to the proper thread contour. All teeth are ground and checked with a contour gage, the same amount of metal being removed from each tooth. The abrasive wheel is small in diameter, revolves at high speed and has a relatively limited service life, being frequently dressed to the proper contour and renewed whenever necessary. The operation of grinding a 55-tooth gear usually takes from four to five hours. It is estimated that the gear life is practically doubled by this gear tooth regrinding process.

Car-Wheel Grinder

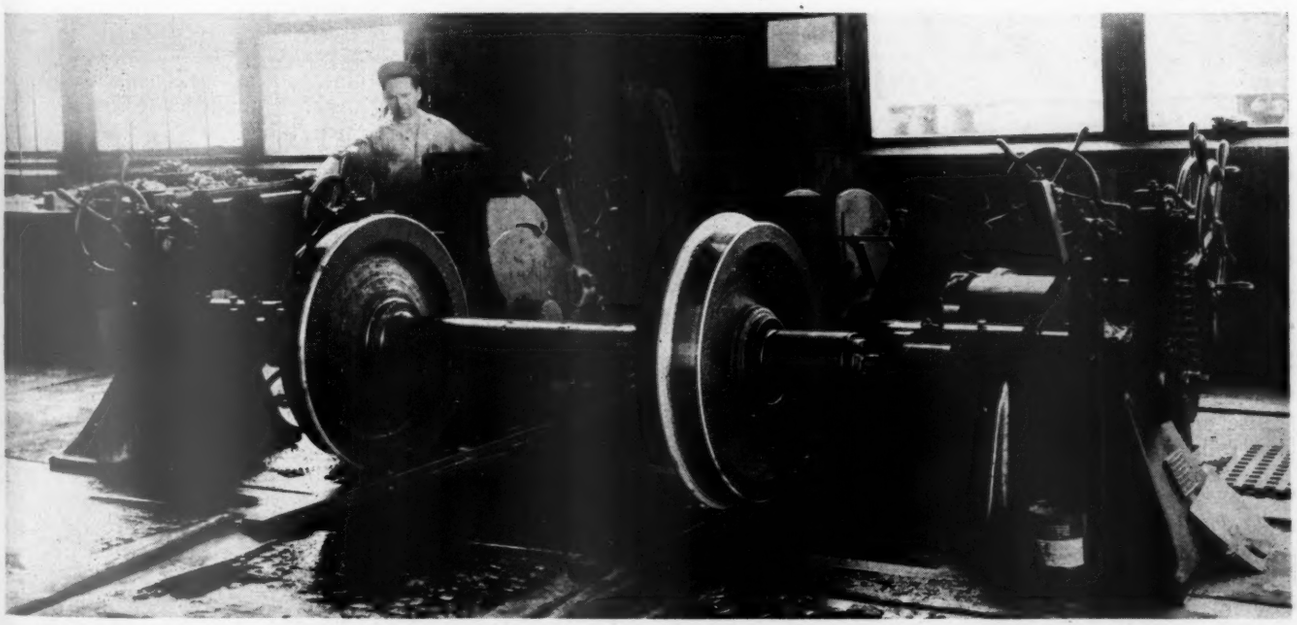
The A. C. F. car wheel grinder, installed in the northwest corner of the Santa Fe Diesel locomotive shop at Chicago, is used to grind all types of car and Diesel locomotive wheels, wheel threads being made accurately round and concentric with the journals and flat spots being removed when necessary. Santa Fe passenger-car wheels are turned with cylindrical threads, but Diesel locomotive wheels are machined with standard taper tread contour. Wheels ground in this machine come out of the lathe with .010 in. of round and are ground within .002 in. with a limit of .005 in. The production of this grinding machine is about 15 pairs of steel wheels in eight hours.

The A. C. F. grinder utilizes two 4-in. by 8-in. pneumatic tires carrying 90 lb. air pressure to revolve the wheels which are rolled into the machine and held between centers. Each of the 2¼-in. by 3-in. grinding wheels is driven by a 25-hp. electric motor with multiple V-belt drive. The grinding heads are adjustable longitudinally and laterally, and also to have the same angularity as the wheel tread. The depth of cut is indicated by power imput to the electric motor as shown by an electric meter.

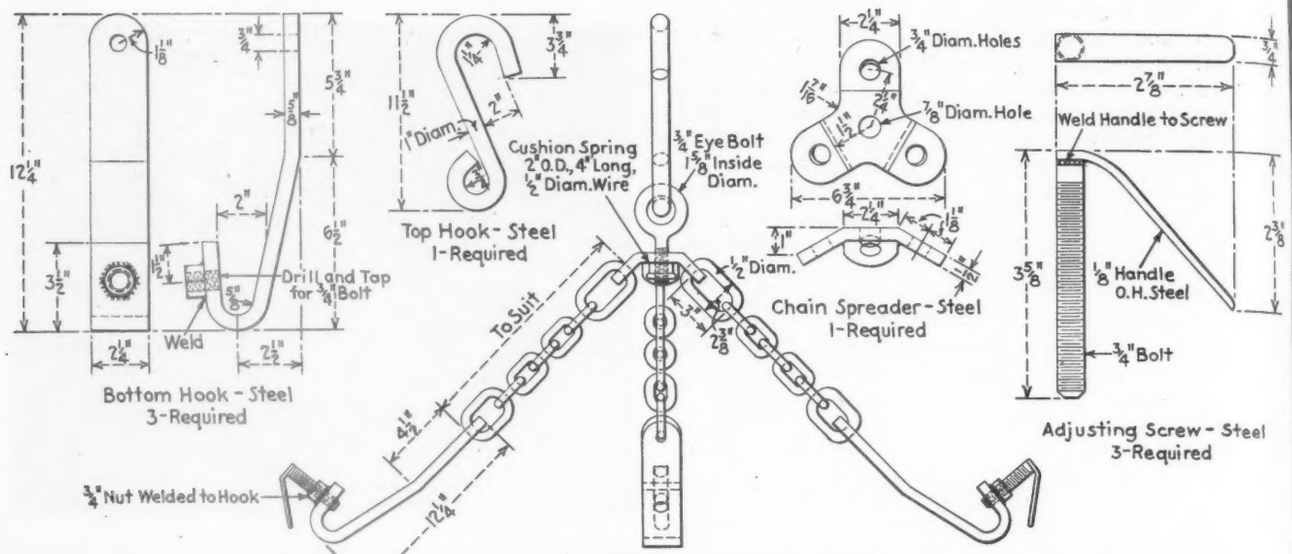
Induction heating device used in bringing pinions to the required temperature for re-application on armature shafts

Sling for Lifting Smoke-Stack Extensions

Many different devices have been developed around erecting shops and enginehouses for lifting draft pipes, or smoke stack extensions, and holding them in place while they are being bolted up inside the smokebox. One which came to our attention recently is shown in the accompanying drawing which consists of three chains



A. C. F. wheel-grinding machine installed at the Santa Fe Diesel locomotive shop



Details of the parts required for the smoke stack extension sling

with bottom hooks to go over the bead of the smoke stack extension, each hook having set screws to secure it in position. The three chains are secured to a spreader which in turn has a central eyebolt and S hook for attaching to the chain from the crane.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Hot-Finished Or Cold-Drawn Tubes?

Q.—Are hot-finished boiler tubes superior to cold drawn tubes, for use in locomotive boilers?—E. K. M.

A.—A committee of the Master Boiler Maker's Association favored hot finished tubes in preference to cold drawn tubes based on relative merits as follows:

"1—*Surface*—Cold-drawn tubes require soft annealing which is annealing at rather high temperatures. Such tubes have a surface scale which is not always as tightly adhering as might be desired. Hot-finished tubes, because of being mechanically worked by reelers and sizing rolls down almost to the critical temperature, have a more uniform, thinner, and closely adhering scale.

"2—*Crystalline Structure*—Cold-drawn tubes, because of more severe mechanical working in a longitudinal direction, show an elongation in crystalline structure which is sufficiently pronounced to be visible under the microscope even though the tubes are thoroughly annealed. This indicates a greater strength longitudinally than transversely. Hot-finished tubes show a more uniform crystal size and a structure which is uniform in any direction.

"3—*Physical Properties*—When a cold-drawn tube is annealed to such an extent that its elongation is practically the same as hot-finished tubes, the yield point and ultimate strength of the cold-drawn tube is from 5,000 to 8,000 lb. under the yield and ultimate strength of the hot-finished tube. These figures, from a tabulation of average results, indicate that hot-finished is stronger than cold-drawn with practically the same ductility.

"4—*Strength Under Pressure*—Hot-finished tubes, because they are finished above the critical point of the steel, are practically as strong transversely as longitudinally. They show higher bursting pressures than cold-drawn tubes, which fact is only partly accounted for by the higher physical properties. Cold-drawn tubes, because of the method of manufacture, tend to develop lines of weakness to transverse stresses which slightly lowers their resistance to bursting stresses.

"5—*Malleability*—Cold-drawn tubes, because of their longitudinal crystal structure, will not stand beading or other severe manipulating tests as well as hot-finished tubes which show slightly less tendency to split open under test than cold-drawn tubes.

"6—*Uniformity*—In commercial annealing it is difficult to hold all tubes to the same degree of final anneal and, therefore, cold-drawn tubes are not always entirely uniform as to physical structure. In the method of manufacture of hot-finished tubes there is more assurance of uniform structure.

"7—*Resistance to Corrosion*—As far as practical experience is concerned, we have found no appreciable difference in the resistance to corrosion of hot-finished or cold-drawn tubes. What difference there is seems to favor the hot-finished tubes. The department of metallurgy and research of a large manufacturer of boiler-tubes has checked up several investigations and references on the matter of the relative corrosion of hot-finished and cold-drawn tubing and has found that, while there may be some evidence that the hot-finished tubing corrodes less than the cold-drawn, the difference between the two is not very great although it is sufficient for them to be inclined to favor the hot-finished tubing in this connection.

"8—*Dimension Tolerances*—This is one point where cold-drawn tubes show an advantage over hot-finished. From the nature of the cold-drawn process it is quite evident that tubes can be furnished with smaller tolerance than is obtained on hot-finished tubes. In this connection, would refer to standard specifications for boiler tubes wherein cold-drawn tubes are furnished within a thickness tolerance of two gages while hot-finished tubes call for three gages variation.

"9—*Practical Service Comparison*—From what information we can gather, the service of hot-finished tubes indicates more mileage is obtained per flue setting than for cold-drawn tubes but, at the same time, all this cannot be credited to the hot-finished tubes as the change to long runs and water treating conditions have helped this. Of course, the most efficient manner in which to determine this definitely is to conduct a test in actual service; one side of the boiler being fitted with hot-finished tubes the other side with cold-drawn tubes. This test would run over a period of several years and, therefore, this committee is unable to state what the actual results would be."

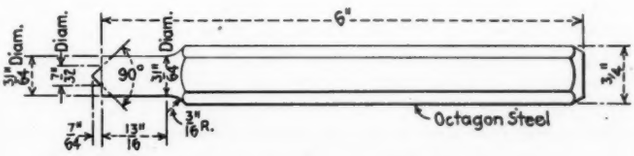
More About Side-Sheet Template

The accompanying illustration of a template used at the South Louisville, Ky., shops of the Louisville & Nashville for laying out half side sheets for locomotive boilers was first published as a filler cut in the March, 1943, *Railway Mechanical Engineer*. Considerable interest was displayed in this template and the following additional information is supplied through the courtesy of the L. & N. The template shown is made of ⅛-in. tank steel. It has ½-in. diameter holes punched in it, representing the holes to be punched or drilled in the side sheet. The template is merely placed in the proper position on top of the material that is to be used for the side sheet and clamped to the material with C-clamps. The hole locations are center marked through the holes in the template with a ½-in. center dab.

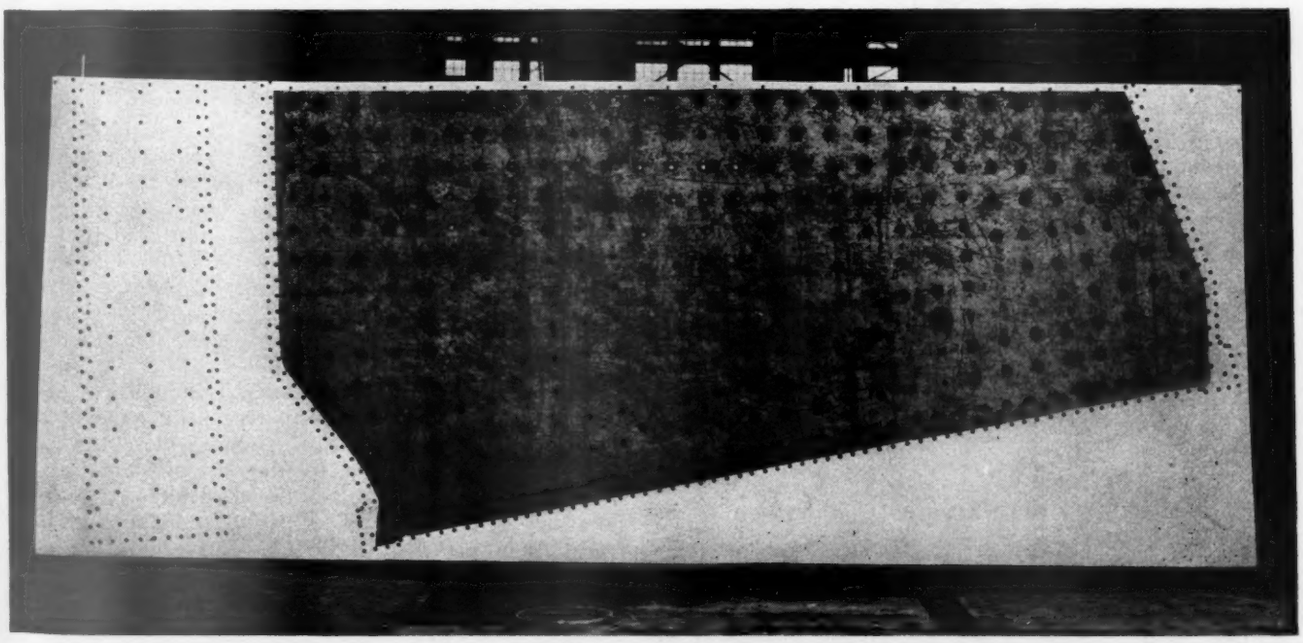
This template is used for J-3 class locomotive of which there are 93 on the L. & N. A slight variation is found in a few of the staybolt holes between those built by one locomotive works and those built by another. The 93 J-3 class locomotives are divided up in series thus: 18 were built by the Lima Locomotive Works in 1919; 15 were built by the Richmond Locomotive Works in 1920; 10 were built by the Schenectady Locomotive works in 1922; 30 were built by the Richmond Locomotive Works in 1922; and 20 were built by the Brooks Locomotive Works in 1923.

The variation in the staybolt holes between the series of the same class of locomotive mentioned above is taken care of by punching smaller holes in the template showing other series. When the side sheets are marked off from the template according to locomotive class the staybolts are never out of line.

The mud-rings of all locomotives built in the South Louisville shops are marked off carefully by using a level and straight edges to locate the lines for setting mud-ring templates. The holes are centered through the ½-in. holes in the template. The mud-ring is then plumbed and leveled on a four-spindle drill press and ¼-in. holes are drilled about ½ in. deep where the center marks were made. This operation is followed up by drilling the full-size holes. The small ¼-in. drill follows the center mark, and the full-size drill follows the ¼-in. hole accurately. No difficulty has been experienced with mud-rings drilled at builders' shops matching side sheets marked off from the L. & N. templates.



Center dab used with the firebox side-sheet template



Template used in laying out half side sheets for locomotive boilers at the Louisville & Nashville shops, South Louisville, Ky.

With the Car Foremen and Inspectors

Car Inspectors And Car Inspection*

By R. V. Ketring

The majority of people think of a car inspector, oftentimes referred to as a "Car toad," as a fellow with a hammer, dressed in overalls, walking around a train yard or car yard, tapping wheels. However, the Association of American Railroads have a different idea of the qualifications of a car inspector. He should have the following experience: Before being promoted to the position of car inspector, he should have one year at oiling cars, two years at car repairing. Age limit for new men, 30 years; age limit for promoted men, 40 years; vision 20/20 in one eye and 20/40 in the other, without glasses. He should be able to write English legibly, and also be able to read manuscript matter as well as printed matter; he should be able to name each part of cars in general, using A. A. R. terms and not slang terms. Must pass a satisfactory examination of at least 75 per cent—car inspectors examination—of the A. A. R.—loading—explosives—safety appliances, and other rules governing the handling of freight and passenger cars, of which there are 120 questions in our examination book. He should know and be familiar with I. C. C. defects, of which there are listed 269.

Car Inspection

On the railroads of this country, the complete and thorough inspection of all equipment used in traffic movement constitutes a very essential and important detail. Ordinarily, freight cars are inspected in receiving yards, classification yards at loading points, such as team tracks, freight houses, and on the various repair or shop tracks. Passenger cars are inspected enroute at stations where they pick up and discharge passengers, load and unload baggage, and in what are known as coach yards, where cars are cleaned and made up into trains.

Car inspection of passenger cars is generally divided into two classifications:

(1) Passing inspection at intermediate terminals, which constitutes making an inspection of all trucks, wheels, couplers and parts, safety appliances, testing and inspection of air brakes and steam heat equipment.

(2) Coach yard or preparatory track inspection, which constitutes a very thorough inspection of all parts of the cars, which includes testing of all equipment, such as electric and air conditioning, water system, air brake and steam heat equipment, inspecting and oiling all journal boxes.

On a good many railroads, they have inspection pits in their coach yards for the underneath inspection of passenger cars, especially for high-speed trains, better known to the public as streamliners.

Car inspection of freight cars is generally divided into three classifications: (1) train yards, (2) classification yards and (3) repair tracks. Some railroads use the following symbols for inspection: *A* for train yards, *B* for classification and *C* for repair tracks.

Train yard inspection is handled in yards where trains arrive and depart; on some roads trains are given inbound inspection. Then, when a train is made up, all that is necessary is to attach the outgoing engine and then test the air brakes. Other roads give outbound inspection by waiting until train is made up, then they give it an air test, and the usual inspection is given, which is an inspection of all trucks and parts, couplers and parts, safety appliances, air brakes, etc.; all loads are inspected to see that they are properly loaded according to rules, and journal boxes inspected and oiled. However, not all division points are oiling stations; they are generally spaced about 600 to 800 miles apart.

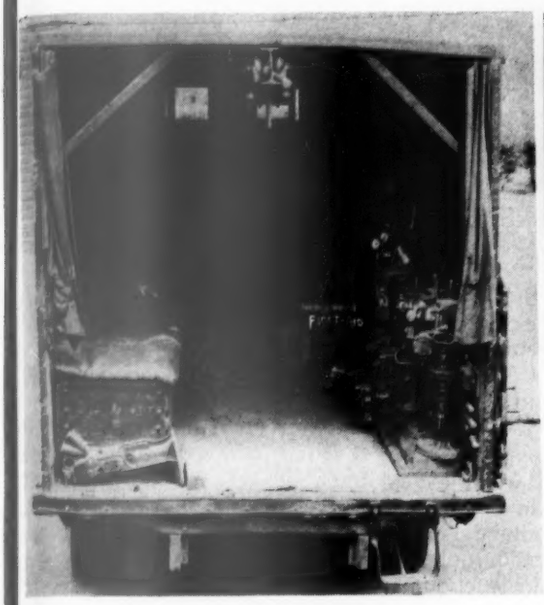
Classification yard inspection is generally handled where empty cars are assembled, such as storage yards, light repair tracks in train yards, freight houses, industry tracks and team tracks. On inspection of cars in these locations, they are given a thorough inspection to determine for what class of loading they may be fitted, such as on house cars, they are divided into four classifications, *A, B, C* and *D*; *A* and *B* cars are for high-class freight, such as sugar, flour, merchandise, beans and other similar commodities; *C* and *D* cars are for lumber, tin plates, sheet steel and rough freight of all kinds. Refrigerator cars are inspected, and on some roads they are classified as *R-1* for first-class perishable loading, *R-2* where cars contain ice in bunkers and it is not removed, or the cars are otherwise unfit for *R-1* loading. *R-3* cars are without floor racks and are fit only for canned goods or similar commodities.

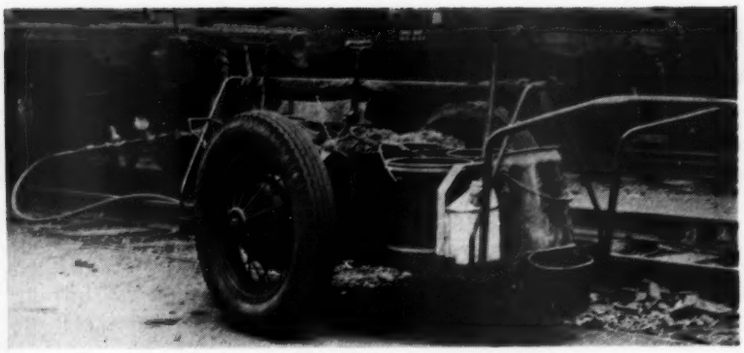
Other freight cars, such as tank cars, coal cars, and flat cars, are given the same kind of inspection; they are not generally separated into different classes, but are picked out for the different kinds of loads.

In making this inspection, in addition to determining what class of commodity the car is fitted for, the air brakes, trucks and parts, couplers and parts, safety appliances, doors, roofs, etc., are thoroughly inspected to know that the cars are fit to be loaded and carry their loads to destinations without delay.

Repair track inspection is generally handled on tracks known as car-shop tracks, rip tracks or repair tracks, and the majority of the cars reaching these tracks are cars that are bad ordered, for they are given a thorough inspection, and if any additional defects are found, necessary repairs are made. When cars are on these tracks they are also thoroughly inspected for heavy repairs. Thus, a car that may be bad ordered for old air date, when inspected may be found to have flooring, siding or other parts that are in need of repair; the car is then sent to the heavy repair track for necessary attention.

* Abstract of a paper presented at the August 12 meeting of the Pacific Railway Club held at Los Angeles, Calif.

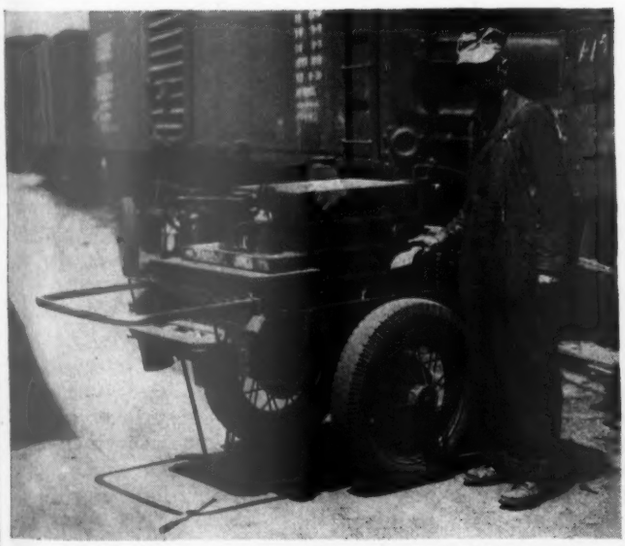




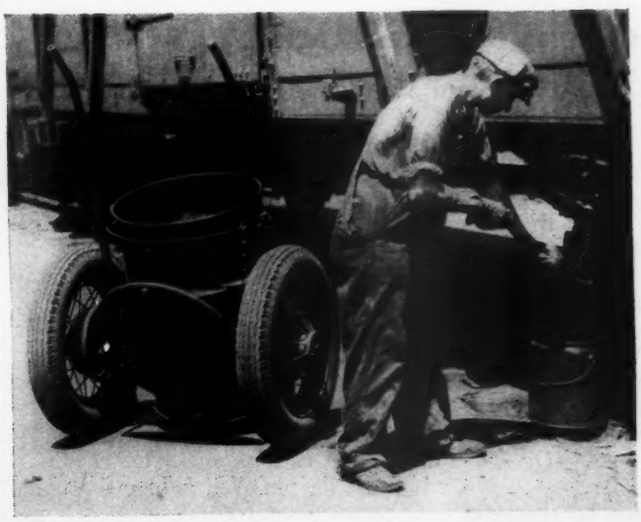
Above: Cart for box packers on which are carried nine buckets of waste, oil for free oiling, and a packing iron—The canvas cover protects the waste in rainy weather—Left: A truck equipped for light wrecking operations used on derailment calls—Equipment includes a two-ton chain hoist, two 50-ton jacks, two 15-ton jacks, burning equipment, blocks and wedges, track jacks, chains, replacers, new brasses, and flares and acetylene lights

Helps for the Car Foreman

Erie's Penhorn Shop Speeds Servicing



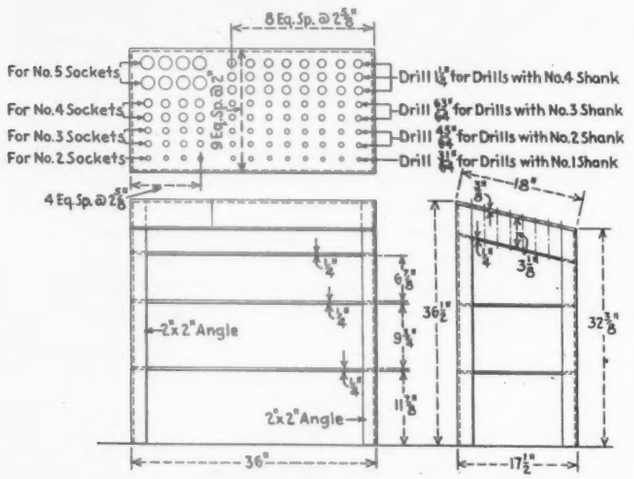
Left: Service cart for the use of men employed to check and replace bearings—Twenty-four bearings of various sizes can be carried in the rack—The cart also is equipped with a journal jack and necessary blocks, a can of car oil, a bar, paint and stencils for changing the packing date on a car, and other miscellaneous small tools which are, from time to time, required



Right: A pneumatic-tired cart which is used to carry a drum into which is placed waste removed from journal boxes—The cart is easily pushed about the car yard and readily maneuvered in close quarters—When full, the drums are covered and loaded in a stores-department cart for forwarding to the waste-reclamation plant

Shop Table for Sockets and Reamers

The numerous sizes of drills and drill sockets having Morse taper shanks that are used around tool rooms and at drill press locations always present a problem of storing in an orderly manner so that the proper size may be readily selected. One way of doing this



Welded metal stand for storing taper shank drills and sockets

is by the use of a steel table constructed, as shown in the accompanying drawing, after the style of a desk. This table has a top 18 in. wide by 36 in. long, designed in such a manner as to provide storage space for 64 drills, having Morse taper shanks from Nos. 1 to 4, inclusive, and 28 sockets having Morse tapers from Nos. 2 to 5, inclusive.

The table is constructed of 2-in. by 2-in. angle legs with ¼-in. steel plate shelves and a ⅜-in. steel plate top. Welding is used for assembling. The sizes of the holes to be drilled in that end of the table used for drills are shown in the drawing. The holes in the opposite end of the table should be drilled $^{45}/_{64}$ in. for No. 2 sockets; $^{63}/_{64}$ in. for No. 3 sockets; 1¼ in. for No. 4 sockets and $1^{23}/_{32}$ in. for No. 5 sockets.

Air Brake Questions and Answers

Installation and Maintenance of Axle Generators

208—*Q.—How would you proceed to remove the armature and bearings?* A.—To remove the armature and bearings first take out the four bolts (Ref. *48*, Fig. 10) in the rear end bell, and then remove the end bell by tapping the inside surfaces with a rod or bar of suitable size to pass between the inside of the generator housing and field assembly clamping bolt. The Type A drive may be removed from the armature shaft either before or after the end bell has been taken off. When reapplying the armature and end bell to the generator housing extreme care must be taken to follow the detailed instructions supplied by the manufacturer.

209—*Q.—Does this same rule apply to the Type B drive?* A.—No. It must be removed before the bolts can be removed.

210—*Q.—Is it necessary to remove the metal disc at the front of the generator in order to remove the armature?* A.—No.

211—*Q.—What attention should be given the generator periodically?* A.—It should be removed periodically from the journal box, cleaned thoroughly, inspected and lubricated in accordance with manufacturer's instructions.

212—*Q.—How is the voltage test made?* A.—Place the generator in a suitable rack provided with means for turning the armature at a known speed, not less than 600 and not more than 900 r.p.m. A voltmeter should be connected to the two brush holders and the generator loaded by means of a resistor in accordance with the manufacturer's instructions.

213—*Q.—What is the allowable voltage value, and what should be done if it is too low?* A.—The voltage delivered when loaded must be between the minimum and maximum values as given on the graph furnished. If the voltage is not within the limits shown on the graph, the output may be adjusted in accordance with detailed instructions from the manufacturer or may be returned to the manufacturer for adjustment.

214—*Q.—What is the polarity of the brush holder on the side of the generator opposite the cable outlet when the armature rotates in a clockwise direction?* A.—Positive (+) when the armature rotates in a clockwise direction as viewed from the front.

Back-Up Valves

215—*Q.—What types of back-up valves are used?* A.—The Type B2 (Fig. 7) and DE-1 (Fig. 6).

216—*Q.—Where and when is the Type B-2 used?* A.—On rear cars from which back up movements are controlled only when the automatic brake is used in the head end.

217—*Q.—Is it used when the HSC electro-pneumatic brake is used on the head end.* A.—No. It is not intended for use in this case.

218—*Q.—What pipe connections does this valve have?* A.—Two ¾-in. pipe connections; the one at the right connecting to the brake pipe, the other to the exhaust.

219—*Q.—Describe the operation of the B-2 back-up valve.* A.—A lever type handle *20*, operates key *4* and a curved slide valve *7* which is seated over a tapered port in bushing *3*. As the handle is turned in the direction of the arrow cast on the body, the slide valve uncovers an increasing area of the tapered port *k* permiting brake pipe air to discharge to the exhaust. The total movement for complete opening, which is emergency position, is 90 deg.

220—*Q.—What is there about the construction of the valve which permits gradual opening?* A.—The face of the slide valve is recessed with bearing surfaces only at the edges. This provides a low bearing area which with the lever handle permits gradual opening and, therefore, has the ability to control the reduction rate in accordance with train length.

221—*Q.—What provides for back-up movement?* A.—A whistle is provided for back up movements. This is operated by button *14*, which moves stem *16* and unseats valve *15*, admitting air to the whistle valve pipe. The tap for this pipe is ⅜-in. Spring *17* is light, sufficient to insure seating of the valve but low enough to permit easy button operation.

222—*Q.—Of what does the DE-1 back-up valve consist?* A.—It consists of an electric portion and an automatic portion, both operated from the same handle and shaft. Contact drum *11* controls three contact fingers *30*,

which are connected to (*1*) application wire, (*2*) release wire, (*3*) the positive (+) battery wire at plug connector *35*. Rotary valve *17* controls venting of brake pipe air from connection *39* to the exhaust in accordance with the handle position.

223—Q.—How many handle positions does this valve have? A.—Seven, indicated by quadrant notches.

224—Q.—Name the positions. A.—Electric release, electric lap, electric application, and automatic lap and automatic application, including last four notches.

225—Q.—Describe the electric release position. A.—Brake pipe exhaust closed, all electric contacts open.

226—Q.—Describe the electric lap position. A.—Brake pipe exhaust closed, drum connects upper and lower finger contacts, thereby closing battery wire (*3*) to release wire (*2*), thus energizing the release magnets of the *21-B* magnets which close their exhausts and retain brake cylinder pressure.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Splicing and Painting Tank Car Jacket Sheets

On August 31, 1941, N. A. T. X. car No. 9531, a class 3 insulated asphalt tank car was derailed and overturned on the Texas & Pacific. On September 6, the car owner, the North American Car Corporation was requested to furnish the A. A. R. depreciated value. This was given on September 8. The car was moved to a T. & P. shop and the owner advised that repairs would be made. The T. & P. released the car on December 18 and it was moved to the owner's shop where a joint inspection was made. The owner, on the basis of this inspection, requested defect cards to cover numerous improperly repaired and unrepaired items. The T. & P. issued its card for a number of the items and the case was resolved into a determination of the following questions; whether a tank jacket head was improperly straightened when it was still bent and cut; whether a car was improperly cleaned and painted when paint was applied over asphalt on parts which had not been damaged and repaired; whether welded splicing of tank-jacket sheets was permissible when the car owner's standard with reference to weight and thickness was followed and the splices were in inconspicuous locations; whether a spliced jacket dome sheet violated car standard; whether 24-in. welded splice plates instead of 36-in. plates on the center sills were wrong repairs; and, whether a tank test was required merely because the car had been turned over when the tank showed no visible defect.

In a decision rendered November 16, 1942, the Arbitration Committee ruled that: "Rule 16 permits patching of tanks of tank cars and, therefore, the splicing or patching of jacket sheets is not considered wrong repairs. The presence of asphalt on the empty tank cars is an owner's responsibility. The nature of damage to the tank did not require a test after completion of repairs. Handling line should issue additional defect card for the tank jacket improperly straightened and center sills improperly spliced."—*Case No. 1790, North American Car Corp. versus Texas & Pacific.*

Allowance for Wheel Removal to True Journals

Cars of both the Atlantic Coast Line and the Florida East Coast operate in high-speed passenger service over each other's lines. When wheel changes were made on A. C. L. equipment by the Florida East Coast, the latter was charging full labor allowances under Items 21, 22 and 23 of P. C. Rule 21 when it was necessary to true journals but where neither wheels nor axle were scrap. The A. C. L. contended that it should not be penalized because another road lacked facilities to turn journals without dismounting wheels. Its claim was that Item 24 of P. C. Rule 21 applied.

The Committee on November 13, 1942, decided that: "Since neither wheel nor axle was scrap, the deduction specified in Item 24 of Passenger Rule 21 is in order. The contention of the Atlantic Coast Line Railroad is sustained."—*Case No. 1793, A. C. L. vs. F. E. C.*

Service Life of Emergency Bearings

As a part of the National program inaugurated in December, 1941, for the conservation of critical and scarce materials, the General Committee appointed a Special Committee on Journal Bearing Development to investigate the possibilities for the conservation of critical metals in car journal bearings. This Special Committee carried out an extensive laboratory research involving the study of bearing modifications with particular reference initially to the possibilities for the conservation of copper, tin and other critical metals by the reduction in weight of the bronze back—babbitt lined A. A. R. type bearing within the limits of safe performance.

As a result of these studies the present Emergency design of bearing was adopted and went into production during the second quarter of 1942. A circular letter issued under date of August 16 by the Mechanical Division calls attention to the fact that, starting in the New England District early this year, it was reported that the Emergency bearings were not standing up in service and since that time complaints of this character have been received from several quarters in the United States and from Canada. These reports infer that the Emergency bearing is structurally weak and that hot boxes are developing in large numbers account of the inability of the Emergency bearing to stand up in every-day service.

"The several complaints directed to this office," the letter continues, "have been referred to the Special Committee on Journal Bearing Development and to the Lubrication Committee and were considered at length at a joint session of these two committees held on May 19, 1943, and again by the Special Committee at a meeting held on July 14-15, 1943, at which meeting a sub-committee was appointed to make a full report based on a survey now under way.

"As preliminary to this complete report, the Mechanical Division states that the following facts which have been developed by the Special Committee as relating to their investigation of the specific complaints referred to them:

"1—From laboratory tests carried out by the Com-

mittee, they know that stock bearings of the emergency design will carry full journal load at speeds up to 100 m.p.h. with the atmospheric temperature around 100 deg. F. without developing abnormal running temperatures or showing greater deformation than the pre-standard bearing.

"2—Thickness of the bronze back of the emergency bearings at the crown is the same as that of relined bearings run on the railroads of the country for year prior to the adoption of the emergency design.

"3—Inspections of considerable numbers of bearings in scrap at various points in the country by the members during 1943 have shown that the emergency bearings in scrap up to this time may be classified under two general headings: (a) Those removed at wheel changes after relatively short service. The majority of these bearings are in good condition and could be reapplied to journals of proper size and would make many miles of additional service. (b) Those involved in over-heatings; evidence of originating cause not apparent from condition of scrap bearing but generally following the pattern of like failures of the pre-war design—over-heating to degree to cause lining flow or lose lining entirely, followed by the cracking or breaking up of the bronze back.

"4—The committee members find that the foundation for the reports being circulaated is apparently the cracking and breaking of the bronze backs of these bearings involved in over-heatings and a generally prevalent belief that the reduced lining thickness and weight reduction of the bronze backs are the originating cause of the over-heating of the Emergency bearings so involved.

"5—Inspection of any accumulation of journal bearing scrap will show that the cracking and breaking up of the bronze backs of all car journal bearings involved in over-heatings is a typical condition. Pre-war bearings fail in the same manner and from the same cause, namely, an inherent characteristic of hot shortness of the bronze material from which both the Pre-war and Emergency car journal bearings are made.

General Facts Applying to Car Journal Bearings

"1—Along with the change in dimensions, the specification covering the composition of the material in car journal bearing backs has been changed as a conservation measure. The present specification permits of a higher lead content at the expense of copper and tin in the Pre-war specification, thus, the composition of metal in the backs may increase the hot shortness by reason of a higher lead content.

"2—Government orders limit the tin content in all solder used in industry and has made it necessary to change the solder used for bonding linings to backs of car journal bearings produced during the past several months.

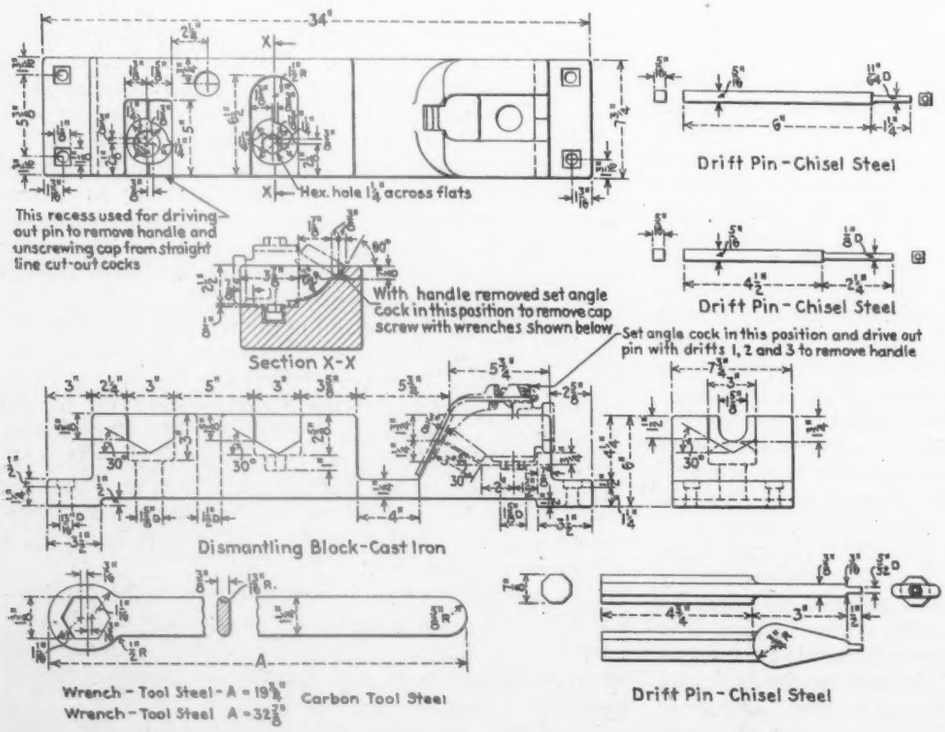
"3—During the transition period from Pre-war to Emergency bearings, manufacturing difficulties by reason of the reduced lining thickness resulted in the production of numbers of inferior Emergency bearings.

"4—The elimination of the individual railroad markings on the Emergency bearings, as a conservation concession to the bearing manufacturers, has apparently resulted in numbers of these inferior bearings getting into service.

"5—The available facts to date indicate that, with comparable materials and workmanship, the Emergency design represents an improvement rather than a backward step in car journal design.

"In conclusion, the Special Committee invites member roads to continue making reports covering the service of the Emergency design bearings but ask that these reports be limited to failed bearings *which have not been involved in hot boxes.* The Committee will be particularly interested in Emergency bearings showing cracked or broken backs, sheared lugs or collars and worn through linings (crown or sides) and will appreciate it if bearings showing unusual failures of these types be sent to the Committee at the Indianapolis Laboratory, care of William I. Cantley, Chairman, 510 South Harding Street, Indianapolis, Ind."

* * *



Block for Dismantling Air Line Cocks

The accompanying working drawings show the details of a dismantling block for use on the bench in the air brake repair shop. The cast iron block, which is secured to the bench by four bolts, has three recesses into which the cocks are placed. The drawings show how the cocks are inserted in the right-hand recess while the pins which secure the handle are driven out. The second recess is for removing the cap screw and the third recess for holding the straight-line type of cut-out cocks while removing both the handle pins and cap screw.

ELECTRICAL SECTION

Circuit Calculator

A small calculator, which takes the place of several conversion tables, for determining current and voltage values on various types of circuits, and conversely kva., kw. and hp. values when voltage and current is known, has been developed by V. W. Palen, Editorial Service, Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., and is now being distributed by that company.

It solves single- and three-phase problems expressed by the following formulae:

(a) Single phase

$$\text{Kva.} = \frac{\text{volts} \times \text{amp.}}{1{,}000}$$

$$\text{Kw.} = \frac{\text{volts} \times \text{amp.} \times \text{p.f.}}{1{,}000}$$

$$\text{Hp.} = \frac{\text{volts} \times \text{amp.} \times \text{p.f.}}{746}$$

(b) Three phase

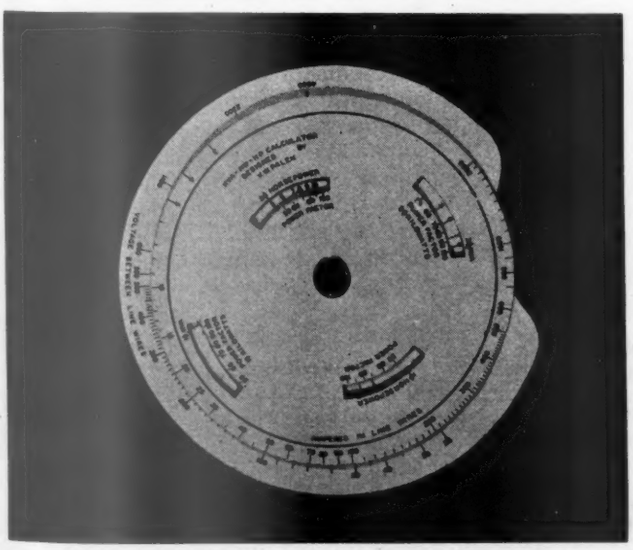
$$\text{Kva.} = \frac{\sqrt{3} \times \text{volts} \times \text{amp.}}{1{,}000}$$

$$\text{Kw.} = \frac{\sqrt{3} \times \text{volts} \times \text{amp.} \times \text{p.f.}}{1{,}000}$$

$$\text{Hp.} = \frac{\sqrt{3} \times \text{volts} \times \text{amp.} \times \text{p.f.}}{746}$$

The range of the calculator, 5 to 200 (kva., kw. or hp., as the case may be), can be extended easily to cover a range of 50 to 2,000 by multiplying all values by 10. It can be used to find kva., kw. or hp. from known values of current and volts; similarly it will determine amperes for given values of voltage, kva., kw. and hp. Thus, knowing the size motor to be installed, an electrician can quickly determine amperes—from this he knows what size wire to use for the circuit. Conversely, having read amperes at transformer terminals, the calculator tells what load, in kva., the transformer is carrying.

The calculator as distributed consists simply of two dials printed on a piece of 8 in. by 10 in. silver print paper. The recipient must mount these on cardboard, cut out the slots, trim the edges and mount the dials one on the other by means of a small bolt through the center.

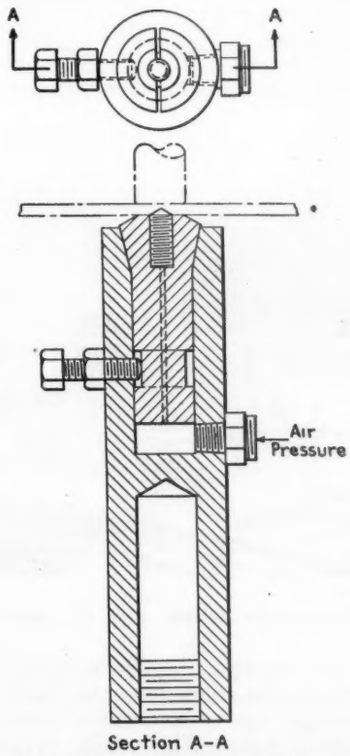


The calculator as made up from the prints supplied by the manufacturer

Device Improves Projection Welding

A device which makes practically fool-proof the projection welding of steel studs on metal hinges and sheet metal surfaces has been perfected by Andrew Campriello, a foreman and spot welding expert at General Electric's Schenectady works.

The device calls for a vertically-milled slot in the collet, which is located in the bottom electrode. The collet is tapered. When the stud is introduced in the collet and the upper electrode is depressed, the jaws of the collet close tightly about the stud. The resulting pressure causes the current to be distributed evenly on all sides, and at the top of the stud near the welding zone rather than through the entire stud and then to the sheet.



The jaws of the collet, which hold the stud to be welded to the plate, are released by air pressure at the moment the weld is completed

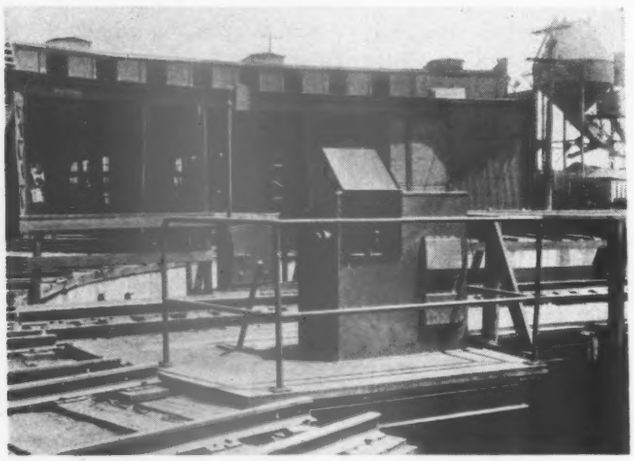
Below the collet is a space for air, forced in under pressure by a hose. As soon as the welding is complete and the upper electrode lifted, the air pressure forces the tapered collet upward. The collet expands and releases the stud. "Binding" of the stud on release was formerly a problem.

When the collet reaches a height sufficient to release the stud, its movement is stopped by a setscrew which engages the bottom of the collet.

Cabless Turntables

For locations where the operation of the turntable is intermittent, the Chicago, Rock Island & Pacific has developed a cabless turntable. The usual cab is replaced with a metal cabinet, as shown, which has a covered

The controller and brake handle are conveniently located



The turntable controller cabinet with the controller door open

opening for the controller handle and two others allowing for access to the contactors and fuses. The brake handle is brought up to a position convenient to the operator's left hand. This neat arrangement improves the performance since the operator has an unobstructed view of the tracks and does not have to get in and out of the cab to lock the turntable.

One-Wire Electrical System

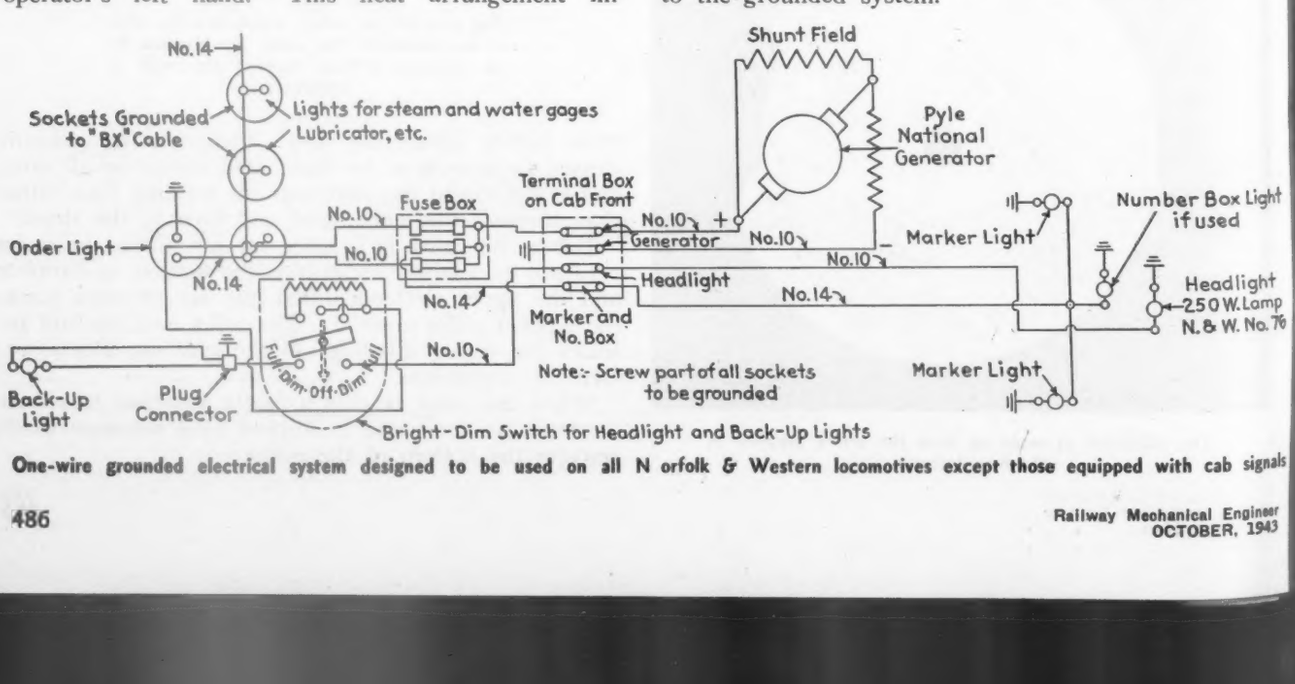
The Norfolk & Western has decided to adopt a grounded one-wire system for the electric wiring on steam locomotives. This will be applied to new locomotives being built and existing locomotives that need rewiring. It will not be used on locomotives equipped with cab signals as the I. C. C. requires an insulation resistance of one megohm between the wiring and ground. The single wire grounded system was adopted because of the conservation of critical materials it effects (rubber and copper) and for the simplification of the wiring.

No change has been made in the conduit arrangement. The insulated wire is the same size as formerly used with the two-wire system, namely, No. 10 rubber-covered wire for the headlight and back-up light, and No. 14 rubber-covered wire for cab lights, markers, etc. One side of the generator is grounded in the cab junction box. It was considered best to place the ground at that point rather than at the generator so that there would be no confusion if generators were interchanged between grounded and non-grounded systems.

In the cab fittings which support the flexible conduit drops to the various gage lights, the hot side of the line is connected to both of the contacts. In the fitting attached to the drop cord, the single wire is connected to only one contact of the cap. This insures anchorage to the lamp regardless of which way the cap may be attached to the base. Connection to a single contact in the cap insures against having a short circuit in case drops are transferred from a locomotive with a grounded wiring system to one having an all-insulated system.

It may be noted from the diagram that the receptacle on the back of the cab for the back-up light connection is grounded and that a two-wire system is used from there on to the back-up light. This was done in the interest of avoiding confusion or trouble in case a tender should be switched from a locomotive with a grounded system to one with a non-grounded system.

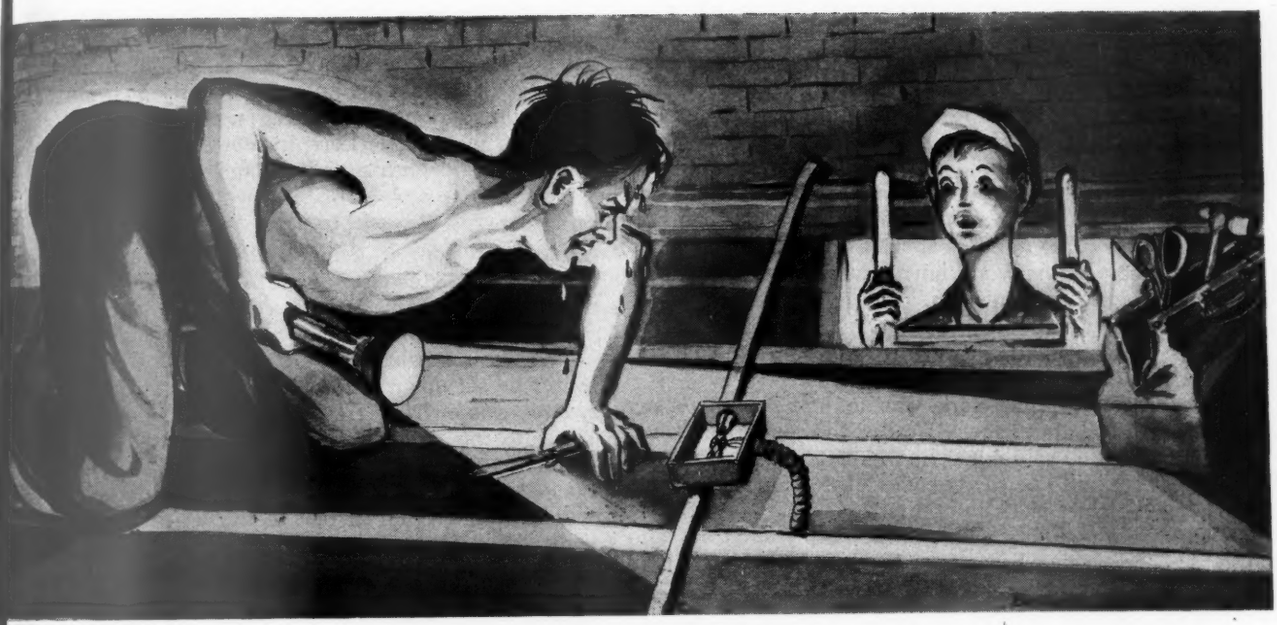
Since it is proposed to wire all new locomotives with a grounded system and to do likewise with existing locomotives which need rewiring, it will be necessary to maintain the double conductor to the rear headlight during the period of transition from the fully insulated to the grounded system.



One-wire grounded electrical system designed to be used on all N orfolk & Western locomotives except those equipped with cab signals

Cooling Off Period

By Walt Wyre



"The chief clerk wants to see you right away."

THE division office building of the S. P. & W. at Plainville was originally a hotel and eating house. The building was remodeled in the depression days when railroads could scarcely afford enough red ink for accounting. The move was motivated by economy and the job was done as cheaply as possible. When Ned Sparks, the electrician on the job, suggested renewing all of the wiring, the idea was vetoed emphatically. Not only did the powers that controlled the purse strings refuse to go along with rewiring, Sparks was told to use only second-hand material for any additional lights required in the office.

When the job was finished, Sparks wasn't proud of what he had done. In fact, he was somewhat surprised when all the lights burned and fuses didn't blow. After about two years, with very little trouble, the electrician had decided perhaps it was a pretty fair job after all, until one day in August. It was so hot that day the mercury didn't have energy enough to climb high as it should have. One boilermaker working on a side sheet claimed he had to lay rivets in the shade to keep them from getting too hot, and Sparks working on a welder in the electric shop wouldn't have argued with the boilermaker.

Sparks was wiping perspiration with one hand and starting a brushholder screw with the other, when a water service man came in with the threadbare question, "Is it hot enough for you?"

"Just about," Sparks replied. "There's only one place hotter than this tin barn and besides the heat, I'm afraid I wouldn't like the company there."

"Yeah, Hilter and his stooges are not going to improve the place when they get there either, and speaking of hell, the boiler feed pump motor is that hot," the water service man said.

"Is it still running?" Sparks asked.

"It was when I left, but it was hot enough to roast a 'wieny'."

"I'll look at it." Sparks mopped his forehead with a piece of waste and picked up some tools and a combination volt-ammeter.

THERE wasn't any doubt about the motor being hot. The characteristic odor that filled the boilerroom was evidence enough. Sparks checked the voltage and found it good on all three phases. He then checked the current and found it to be just slightly above the rating shown on the motor name-plate, not enough to cause heating.

"Is this place closed up all of the time?" Sparks asked the water service man.

"Yes, most of the time. The fuel foreman comes by about twice a day to see if the automatic controls are working properly."

"Well, no wonder the motor is hot!" Sparks commented. "It's like an oven in here and the motor setting right there between the boiler and wall hasn't a chance to

get any air. If I can find a nail bar, I'll pry a section of iron off and make an opening near the motor so it can get a little air."

A bar was found and a section of the old metal roofing with which the boilerroom was sided was removed, making an opening about two feet wide and three feet long near the motor. "Better tell one of the B&B men to make a louver shutter," Sparks suggested.

"What kind of shutter?" the water service man asked.

"One with slats slanted so air can get in and rain can't," Sparks explained.

"O. K.," the water service man said, "I'll tell the B&B foreman."

Sparks had shut off the motor to allow it a chance to cool off a little, but water was getting low in the gage, so he closed the switch. He watched the motor a few minutes, then satisfied that it was running cooler, gathered up his tools and went back to the electric shop.

Jim Evans, the roundhouse foreman, was waiting in the electric shop. "I've been looking everywhere for you," Evans said. "The superintendent's chief clerk has been phoning every five minutes about some electrical trouble in the office. Lights won't burn, but worst of all, the air conditioning outfit won't run."

"I've been up to the boilerroom," Sparks explained. "Guess I had better rush down to the office and fan the chief clerk unless I can get the cooler going."

Dan Smart, the chief clerk, was hot as a peanut roaster at a Fourth of July picnic. "I called the roundhouse over an hour ago," he said when Sparks entered.

"What seems to be the trouble?" the electrician asked, ignoring the chief clerk's outburst.

"Everything—lights won't burn, fans won't run, and the air conditioning has stopped. How long will it take to fix them?"

"Well," Sparks replied, purposely deliberate, "that depends on what the trouble is and how long it takes to find it. Might locate the trouble and correct it in just a few minutes, and again it might take several hours or even days, but I'll see."

The chief clerk swelled up like a toad with a fill of bugs. Sparks left before Smart could think of an appropriate remark and went upstairs where the entrance switch and fuse cabinet were located. He found one of the 60-amp. main fuses blown. When another fuse was put in, the lights came on. Sparks closed the switch box and started down the steps when out went the lights again. Almost immediately there was the sound of some one coming up the steps.

It was Dan Smart. "You had them on once, why didn't you leave them on?" he wanted to know.

"There was just a little current left in the wires," Sparks explained without cracking a smile. "When it drained out, there wasn't any more."

Smart stamped down stairs, and Sparks started trying to locate the trouble.

It didn't take long to find which circuit, or rather circuits, were causing the main fuse to blow. There was a penny under one of the fuse plugs in the lighting circuit to the main office and a nickel under one of the plugs of the circuit to the super's private office and that of the chief clerk. The fan motor for the evaporative cooler was on that circuit also, Sparks remembered.

When the six cents change was safely in his pocket, Sparks screwed 15-amp. fuse plugs in the receptacles and replaced the blown 60-amp. main fuse. One of the 15-amp. plugs went out immediately when the main switch was closed.

The next forty-five minutes was spent disconnecting drop cords, extension plugs, and the cooler fan m None of these was shorted and it didn't require a cr ball to tell that the trouble was somewhere in the duit between the fuse cabinet and the last outlet. question was—where.

"Have you found the trouble yet?" the chief asked when Sparks started to leave.

"Not exactly, I've got to go to the roundhouse to a ringer to locate the trouble."

In about fifteen minutes Sparks returned carryi magneto ringer. He located a ladder and climbed up the attic. The electric shop was hot, the attic was ho and besides the air was so stale Sparks felt like he nee oxygen to stay up there. He worked, sweated, and sw If he stood up he bumped his head, when he knelt ceiling joists hurt his knees. The only position in wh he could work was squatting with a flashlight clam between his knees. Perspiration streaming through dust left trails on his forehead and stung his eyes.

About an hour was all Sparks could stand the tort in the attic. He came down for a drink of water an breath of fresh air. It had seemed warm in the hallw when Sparks went up in the attic, but when he came do it felt like a sea breeze by comparison. After a drink water he sat down in an open window and lighted a c arette. Somewhat refreshed, Sparks climbed up the la der into the steaming attic. He squatted down over junction box on that run of conduit that he had opened. He disconnected the wires and tested. The was a dead ground in one of the wires and it was st somewhere ahead of where he was testing. Sparks twist the wires together again, held a lighted match to t twisted wires to melt and fuse the solder on them a started taping the joint. He started to replace the jun tion box cover when he noticed that one of the wir showed signs of having been hot at some time. The i sulation was rough and wrinkled.

Sparks replaced the cover on the junction box a started to the next and last box.

"Hey, electrician!" some one yelled from below.

"Yeah," Sparks replied. "I'm up in the attic."

The errand boy from the office climbed up the ladd and stuck his head up in the attic. "The chief clerk want to see you right away," the boy said.

"O. K., I'll be down in just a few minutes," Spark replied.

The electrician knew before he opened the last bo that chances of the grounds being in the conduit wer slim. In fact, the idea that the trouble was somewhere i the conduit concealed in the walls had already occurre to him. Tests showed the surmise was correct. Whe the building was being remodeled, several junction boxe were covered, which made it impossible to pull the wire out without removing sections of the wall. Sparks ha mentioned it at the time as an argument in favor of re wiring the building, but no one else seemed concerned.

"If Dan Smart has an idea of bawling me out, it's a poor time to start." Sparks said to the office boy whe the two started down the steps.

"I don't know what he wants," the boy said, "but he seemed in a hurry about something."

"The pump motor at Middleton is burned out," the chief clerk told Sparks. "Did you locate the trouble here?" he asked almost in the same breath.

"Well, yes and no. I located the trouble, two wires are grounded somewhere in the wall."

"Does that mean the wall will have to be torn out?"

the clerk inquired of Sparks in a very anxious voice.

"Either that or running a new line on the outside," Sparks said. "It's a pretty fair sized job in either case."

"You couldn't get it done before the Limited leaves?" Smart was beginning to worry.

"Not hardly," Sparks told him. "It would take at least a day. It's 3:45 now, the Limited leaves at 8:15. I'll not much more than have time to get a motor ready, get tools together, operate an air compressor."

There was a ten horsepower, 1160 r.p.m. motor in the electric shop. Sparks wasn't certain of the shaft size of the motor at Middleton nor the diameter of the pulley, which didn't make a lot of difference because the only pulley he could find that would fit the motor was one six inches in diameter with grooves for five B size vee belts.

THE Limited was nearly two hours late leaving Plainville and pulled into Middleton at 1:35 a. m. Middleton is one of the few towns that has no defense plants or army posts. When Sparks climbed from the crowded coach where he had stood since leaving Plainville, the only person on the platform was the night operator. Sparks helped unload the motor, his tool box, and some express.

"Ben Burns, the water service man from Sanford, is up at the hotel," the operator told Sparks. "He said for me to call him when you got here."

"Does he want to work on it tonight?" Sparks asked.

"Yes, there isn't enough water left in the tank to supply drinking water in the section houses and depot," the operator said.

Sparks walked the four blocks to town looking for a cup of coffee, but the two cafes were both closed. When he returned, Burns was waiting at the pump house.

"How did you get down here from the hotel so quick?" Sparks asked.

"Drove down," Burns said. "I came over from Middleton this morning in our water service truck. I looked at the motor and the winding was charred and knew right away another motor was all that would do any good here."

"Well, if you've looked at it, I'll take your word," the electrician said. "Guess we might as well get the motor down here from the station."

The ten horsepower motor was too heavy for the two men to lift off the baggage truck. They searched around and found a grain door and slid the motor down on it. When the crate was removed, Sparks asked Ben if he had a rule.

He measured the distance between holes on both motors and shook his head.

"Won't it fit on the base?" Burns asked.

"No," Sparks replied. "Lacks nearly an inch one way and two inches the other."

"Maybe we can find a couple of timbers and bolt them to the motor base and fasten the motor to them," the water service man suggested.

"Well," Sparks agreed, "if we can find suitable timbers and bolts, it might work O. K."

Perhaps suitable timbers might have been found in day-time, but the two men failed to find any that night.

"We might find something in the section gang's tool house," Sparks suggested. "Have you got a key?"

"Yes, I think so," Burns said. "We'll take a look."

Spikes, tie plates, a miscellaneous assortment of bolts, and a pile of fish plates was all that was found in the tool house. They closed the door and started to go back to the pump house when Sparks decided to look in the scrap box back of the tool house.

"Say, you've got a cutting torch in the water service truck, haven't you?" Sparks asked.

"Yeah, why—have you found something?"

"Well, I'm not sure," Sparks picked up a piece of flat iron four inches wide, half an inch thick and between three and four feet long. "Why can't we burn holes in this to fit the motor base, then burn some more holes to fit the motor."

"Looks O. K.," Burns agreed. "Let me have one end and I'll help you carry it to the pump house."

It was just a matter of minutes to burn the iron in half, then make holes to fit the motor base. The two men dragged the motor to the base and started to set it on the iron when they saw that the bolts projecting through from the base wouldn't allow the motor to set on the iron. They stood looking at the motor and base. Suddenly Burns had an idea.

"I noticed some 5/8 by 4 machine bolts in the tool house," Burns said.

"How can we use them?" Sparks interrupted.

"Well," Burns continued, "I figured we can weld the 5/8th bolts on top of the iron pieces, then cut off short pieces of pipe and slip over the bolts, then a washer on top of the pieces of pipe will hold the motor clear of the base bolts."

"I believe you've got something!" Sparks agreed.

It required about an hour to weld the bolts to the iron and cut pieces of 3/4 pipe of suitable lengths to slip over them. Then, after considerable tugging and straining, the motor was set on the bolts and nuts screwed on to hold.

"Say, there's something wrong here," Burns said. "The bolts are way too loose. I see what it is, the pulley on the motor you brought is two inches smaller than the one on the other motor. We can set the motor back on the base to tighten the belts, but I wonder what difference it will make with the air compressor?"

"Well," Sparks said, "it will run about three-fourths as fast as before, but I don't know whether it will furnish enough air for pumping or not. We'll have to just try it and see."

When the bolts were tightened in place, Sparks closed the switch and the motor started. In about five minutes water started gurgling in the well.

"Looks O. K.," the water service man said. "I'll tell the operator to start the three-horse motor to pump into the supply tank in about an hour. Let's go to bed! I'll leave word for the agent to call us if it doesn't work O. K."

IT was nearly seven o'clock when the two men went to bed. They slept until about eleven when the heat awoke them. When they had eaten, they went to the pump house to see how the motor was getting along.

"It's doing better than it ever did," Burns said. "The air-lift always pumped more than three-horse pump before and the sump ran over. They are pumping about the same now and the ten-horse motor is not getting hot like it did. This is the third motor to burn out here this summer."

Sparks checked the current to the motor and found it to be just barely over 24 amperes. "Yes, according to the load now, the motor would be sufficiently overloaded with the eight-inch pulley to cause it to heat considerably. Seems like all I've been doing lately is cooling off things. Wish I had something to cool me off right now."

"Me too," Burns said. "Let's go see if we can't find a couple."

Air Filters

What suggestions can you make for getting best performance out of air-conditioning filters particularly with reference to present day operating conditions?

Know Your Dust

For satisfactory filtration of air on air conditioned railroad equipment the filters first should be properly selected or engineered for the particular type of service in which to be used and then filters should be handled properly to insure the efficiency as designed.

There is a wide variation in the analysis of dust according to the geographical territory of operation, season of year and type of motive power used. The operation of trains with Diesel and electric power presents a different problem in fresh air filters than that for coal fired steam power. There is one element in dust which is common to operation with all types of motive power, namely, the very finely divided dust which will pass through a 200 mesh screen. This very fine dust has practically no mass or weight and is carried through the filter in normal flow of air unless the design of filter incorporates necessary features to hold this type of dust.

For operation with coal fired power, particularly in these times, with heavy trains the stack discharge losses are much greater than normally which greatly increases the dust content of the air surrounding the train and supplied to the fresh air filter. With coal fired power the filter is subjected to much wider range in sizes of dust. The dust to filter may range from 40 to 200 mesh sizes including cinders to the talc-like fly ash.

An important detail to consider in fresh air filters, particularly the oil-dipped impingement type, is that the air velocity through filter is set at the manufacturer's recommended velocity. The efficiency of the filter is directly proportional to the air velocity up to the maximum specified by the manufacturer. Conversely, excessively high air velocity through a filter will reduce the filter efficiency.

In such installations where separate recirculated air filters are used a design of filter best suited for its application should be used. On cars where lint condition is bad, such as on diners, the filters should be designed for lint holding capacity with minimum reduction in air resistance. The design of filter should also provide features in construction for simple process to remove lint in ordinary filter washing operation. The plugging of lint in recirculated air filters will overload the fresh air filter, reducing filter efficiency and reduce total conditioned air to the car.

The dust holding capacity of filters should be carefully considered when setting the time between filter cleaning and replacement. When a filter is loaded with dust to its rated capacity, additional service will allow air to pass through filter without filteration. The service period for filters may range from 3 to 30 days, according to the conditions of operation. For an oil-dipped metallic filter it must be considered that the filter functions only as long as there is an oil film to hold dust. A dry filter does not hold dust.

The cleaning and oiling of filters is important for the efficient performance of the filter. The filter should be thoroughly cleaned of all dust and oil, then dried and dipped in a suitable grade of oil. The draining of the excess oil from filter is another important operation for satisfactory filter performance. The filter should be dipped in an oil of such viscosity that a firm uniform coating of oil is provided for all surfaces of the filter media. The viscosity to be heavy enough so that oil will not drain from filter when in service position. Normally two grades of oil are sufficient for summer and winter operation with a mixture of the two grades for the transition seasons.

In these times it is difficult to consider small details but it is often found that the efficiency of the filter is often criticized when by-passing of unfiltered air is the primary cause of the trouble. Careful attention should be given to the maintenance of an air-tight seal between the filter and the filter frame. The plenum chamber is normally operated under a partial vacuum which requires maintenance of an air tight chamber to insure passage of all air supplied through the filters.

The proper attention to air filters to provide most satisfactory possible performance will result in better performance of the air-conditioning apparatus and require less frequent interior cleaning of cars.

AIR CONDITIONING ENGINEER.

* * *

Equipment used by one railroad for cleaning, drying, dipping and draining air filters

Can you answer the following question? Suitable answers will be considered as contributions and will be published in a subsequent issue. If you have questions to ask, send them in also. Answers and questions should be addressed: Electrical Editor, *Railway Mechanical Engineer*, 30 Church Street, New York.

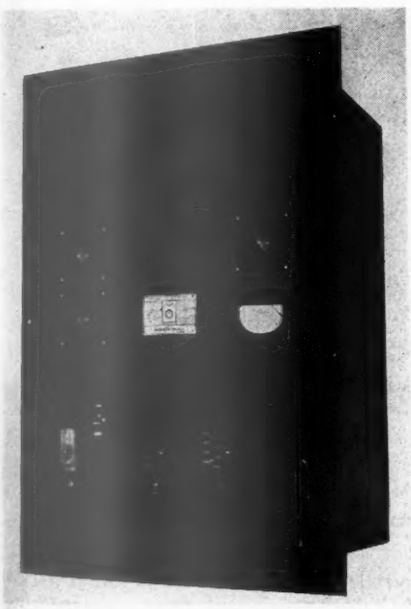
How can a group of unit heaters be controlled to meet the requirements of heating an enginehouse?

NEW DEVICES

Electronic Furnace Control

Because resistance furnace temperatures are apt to vary, engineers of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., have developed the Furnatron control system to keep such variations to a minimum. This is accomplished through combining a suitable thermocouple type of temperature controller with automatic electronic control of the saturation current of a saturable reactor connected in the supply line of the furnace elements, thus automatically controlling the power input into the furnace.

The Furnatron system may be used for furnace temperature regulation and control of a single- or three-phase furnace. Where the line or furnace transformer voltage is not suitable to supply a.c. to the thyratron tubes, an anode transformer is furnished. The droop corrector, another optional feature, is included for installations where the rate of material flowing through the furnace changes, thus compensating for heat exchange due to fluctuations in the rate at which the furnace is being loaded.



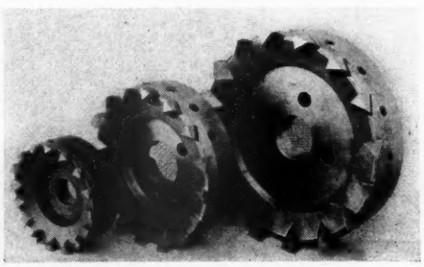
The Westinghouse Furnatron control is designed to keep furnace temperatures within narrow limits

The control also includes a compensator for line voltage variations, since in some cases the power dissipated is roughly proportional to the third power of line voltage, and variations in such voltage greatly affect the operation of a furnace. The compensator practically eliminates the effect of fluctuating line voltage which is especially important on high thermal inertia furnaces. The complete furnace regulator control is built for flush panel mounting.

The installation is guarded by protective devices which include a time delay relay, over-temperature mechanisms, surge suppressors, fuses and suitable disconnecting devices.

Cutter Blades For Face Milling

Triangular-shaped adjustable tool bits for face milling are being manufactured by Weddell Tools, Inc., Rochester, N. Y. These bits are locked home in vee-shaped holes in the cutter body by lock screws. The cutter body is tied together all around the blade without slots. Each bit is backed up by an adjusting screw which permits close adjustments on the cutter blade up to 60 per cent of its length. No wedges are required. The triangular shape of the bits offers better chip clearance because there is no heel on the blade to catch or clog chips. The face of the cutter body is dished out to add to chip space which expands in size away from the cutting edge in the direction of the chip flow.



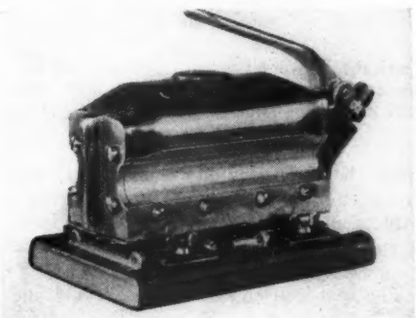
Triangular-shaped tool bits in this cutter body are fastened in place by lock screws

These face mills are made in three different sizes for cuts up to ¼-in., ½ in., and ¾ in. in depth. Cutters are made of high-speed steel, cast alloys or carbide-tipped triangular bits. They can be furnished to standard or special specifications, with any number of bits, set at the required cutting angle for any materials.

High-Speed Hand Sander

Designed and built for all practical hand sanding and finishing operations, the non-vibrating sander, manufactured by Sundstrand Machine Tool Company, Rockford, Ill., is now available in a lightweight, high-speed Model 1000. This smaller and lighter machine weighs less than 6 lb., has a speed of 3,500 oscillations per min., can be equipped with different types of sandpaper attachments for large or small, wide or narrow, flat or curved surfaces on metal, wood, plastics, or composition.

Operation of the machine is obtained with pad movements started and controlled by a palm lever fitted at top of the machine housing. No turning of "on" or "off" switches is required. When the machine is gripped to operate, the reciprocating action of pads starts. Upon release, the machine automatically stops.



High-speed hand sander with moving parts balanced to eliminate vibration

This sander is said to be free from vibration. Opposed-pad action and balance of moving parts are designed to eliminate all vibration and improve the qualities and uniformity of the finished product. Elimination of vibration reduces fatigue and increases the efficiency of the operator.

Uniformity of the stroke and the high speed of the reciprocating pads materially increase the life of abrasive paper by keeping the paper surface substantially free from material particles.

D. C. Vertical Motors

A line of direct-current vertical motors ranging from 40 to 200 hp. at 1,750 r.p.m., and in equivalent ratings at other speeds, has been announced by the General Electric Company, Schenectady, N. Y. The new motors, which are furnished for both constant and adjustable speeds, are designed for low-thrust, solid-shaft applications on pumps, machine tools, and marine underdeck auxiliaries. They are also desirable in cases where valuable floor space must be saved or the expense of gearing avoided.

The motors are drip-proof, protected construction, providing complete protection from dripping liquids and falling objects. convenient fittings on both the upper and

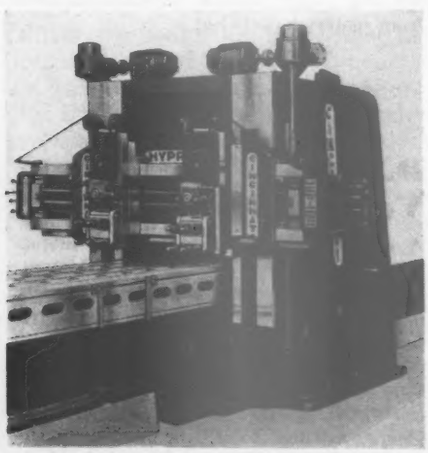
Vertical, drip-proof, semi-enclosed, grease-lubricated, ball-bearing, shunt-wound, 230-volt, d.c. motor rated 40 to 60 hp. at 515 to 690 r.p.m.

lower bearings simplify lubrication, and provision for the escape of excessive grease reduces the possibility of over-lubrication. A special bearing housing prevents grease from entering the motor.

The cast-iron conduit box is roomy and can be arranged for bringing the leads in at the top, bottom, or either side. Two hand-hole covers, removable without the use of tools, permit quick and easy inspection of the commutator end brushes. The ring-type base has an accurately machined rabbet and jig-drilled mounting holes, assuring permanent alignment with the driven machine. Sturdy lifting lugs facilitate installation.

Frog and Switch Planer

An improved frog and switch planer designed for high production with the greatest possible rigidity in withstanding heavy cuts has been announced by the Cincinnati Planer Company, Cincinnati, Ohio, for fall deliveries. It has a double-length enclosed bed with a deep housing cheek bearing to the bed. A full-depth box section arch adds to the rigidity of the housings. A wider vee spread to the bed and table is provided. The table is of greater depth than in previous models and has full length hold-down gibs.



Heavy-duty planer for frog and switch work

A combination herringbone balanced drive is designed to run efficiently and smoothly under the heaviest cuts and it is built for 100 hp. operation. All shafts are of large diameter with hardened, ground and lapped journals. All gears are of steel and hardened. Heavy-wall bronze bushings are used throughout the drive train. Tool blocks, clapper boxes, and clamps are of steel. A Hypro tool-block abutment relieves strain from the clapper-box pin. A self-locking worm is used to swivel the clapper box.

The rail and down-feed screws are of extra large diameter. A long bronze nut is mounted near the top of the slide accessible for easy replacement. There is provision for takeup of backlash in the double bronze saddle nuts. Counterbalanced inverted dovetail slides prevent dropping of the slide and consequent hammering of the screw in the nut as the tool strikes the cut. The rail heads are mounted on a square gibbed narrow guide cross rail.

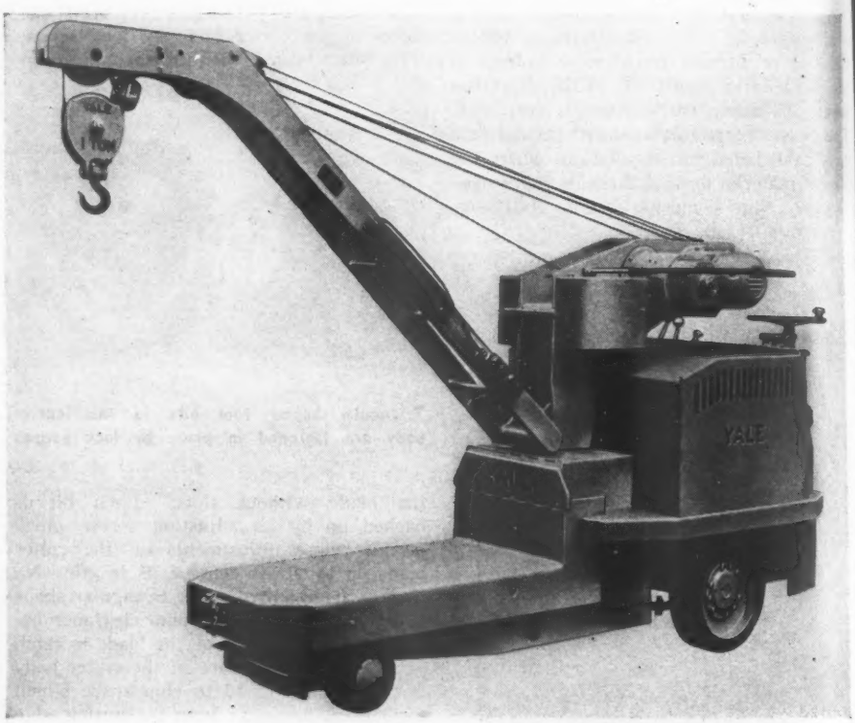
A feed and traverse sealed unit with hardened gears and clutches with all shafts mounted in antifriction bearings running in a bath of oil gives convenience and flexibility to the directional-controlled-traverse and feed.

Instantaneous rail lift is optional equipment. Heads and slides can be fed and traversed in any direction, independently or together. There is a special jigging device for feeding the tool into the work for tapering and trimming as the table moves in the cut direction. Both heads may be moved manually in either the same or opposite directions simultaneously, with a single crank.

The machine was developed in cooperation with frog, switch and crossing manufacturers and is said to be designed not only with consideration for rigidity, weight, speed and accuracy but also for convenience and safety to the operator.

Platform Crane Truck

A multiple-purpose industrial truck for shop use is being built by the Yale and Towne Manufacturing Company, Philadelphia, Pa. It combines a 6,000-lb. capacity low elevating platform truck with a 2,000-lb. capacity twin-unit crane. Electrically powered with four speeds forward, and a reverse, the unit is compact and is designed with small overall dimensions to permit maneuverability in close quarters.



Crane truck with an elevating platform which fills many shop needs

A Yale Cable King winch unit supplies the hoisting and booming power and both can be operated simultaneously through separate push-button crane and hoist control. Separate independent motors and power units drive the truck for travel and to hoist and boom loads. Slewing is controlled by hand. Loads can be picked up and placed upon the platform of the truck or carried on the boom to be placed where needed. When desired the truck can be used for the moving of skids by means of the elevating platform.

CHILLED CAR WHEELS *are practically indestructible!*

When Chilled Car Wheels reach a certain wear-point, they are sent back to our foundries, under our wheel exchange plan, and speedily recast into new wheels with the addition of only 11.22 per cent new pig-iron! Under this wheel exchange plan, the railroads receive new wheels for old on a conversion charge basis. Thus Chilled Car Wheels are practically indestructible, as they can be recast and reused over and over again.

With 38 plants strategically located in the United States and 8 in Canada, quick delivery of new wheels in exchange for old is assured, as are low delivery costs.

1942 CHILLED CAR WHEEL PRODUCTION:

2,682,000 Chilled Car Wheels were delivered in 1942.
885,020 Tons of metal were used to make them.
Of these:
782,131 Tons or 88.38% were scrapped wheels.
99,299 Tons or 11.22% were new pig-iron*.
3,540 Tons or .40% were alloys.
This *IS* Salvaging Scrap for the War Effort!

*Secured with the cooperation of W.P.B.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

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AMCCW

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3350

High Spots in
Railway Affairs . . .

Wartime Passenger Traffic

It is reported that one railway executive, at least, has said that on the basis of recent experiences it would appear that the best way to attract passenger traffic is to conduct a publicity campaign suggesting that the public refrain from unnecessary travel during the war emergency. The appeals of the O. D. T. and the railroads, however, were apparently effective over the Labor Day week-end, for it was reported that there was less traffic than a year ago. Since the middle of July the Southern Pacific has required travel reservations. This has eliminated crowding and standing and is said to have a tendency to spread traffic more evenly throughout the week. It has also "relieved congestion at the larger terminals, since passengers don't come to the stations unless they have obtained space in advance." One road operating out of Chicago posts a "standing room only" sign as soon as the seats of certain trains are filled.

Staggering Traffic

The Bureau of Railway Economics, according to a statement made by Caleb R. Megee, manager of the Open Car Section of the Car Service Division of the A.A.R., before the Southeast Shippers' Advisory Board, estimates that during the year 1943 the railways will carry, measured by ton-miles, more freight traffic than they did in 1918, the peak year of the first World War, plus 1939, the last year of peace.

Jeffers Makes a Record

There is always the danger, when a business or professional man enters public life, that politicians will get the best of him, or at least embarrass him and discredit his performance. Not a few such men have been drafted for public service in the war emergency, at great cost and inconvenience to themselves, but have eventually retired to private life in disgust. Not so with William M. Jeffers, president of the Union Pacific, who was drafted at a critical time (September, 1942) for the difficult position of rubber director for the War Production Board. Chairman Donald M. Nelson characterized it as one of the toughest assignments of the war program. Mr. Jeffers resigned the position early in September because "the big job covered by the recommendations of the Baruch report is done" and "the greatest contribution I can make in the present emergency is to return to an on-the-job handling of the operations of the Union Pacific." The Pittsburgh (Pa.) Post-Gazette made this comment: "The ruffled tempers and broken precedents of Mr. Jeffers' passage through the red-tape of Washington made news copy of a most exhilarating and welcome sort. His record vindicates again our belief that American business and executive talent has an effective role to perform in the management of national affairs."

Narrow Gage Line Converted

The narrow gage lines, familiar to many of the older mechanical department employees who worked on the dinky little locomotives when starting their careers, are passing out of existence in this country. At one time the Colorado & Southern 3-ft. gage system included 384 miles. On August 25 the last of this narrow gage mileage, extending from Leadville, Colo., to Climax, 14.06 miles long, was discontinued and replaced by standard gage. The life of the narrow gage line was shortened because the operations of the Climax Molybdenum mine, on the Continental Divide at Climax, have been so greatly increased during the war, that it was necessary to enlarge the railroad facilities. Work on the change-over began last spring, when work was started on replacing the shorter ties with those of greater length. Eventually rail was laid on each side of the narrow gage rails and the necessary ditching and bank widening work was done. The final change from narrow to standard gage operation was, therefore, handled expeditiously within a 24-hour period. The old, narrow gage cars and locomotives have been sold and part of the equipment will be used on narrow gage lines in Alaska and Hawaii. The old C. & S. narrow gage line has thus, in a sense, "gone to war."

Preparing for the Future

Some of the discoveries and developments in the designing and production of war equipment promise to have a profound effect on our civilian life when peace comes. Many of these discoveries and developments in research laboratories and the new methods inaugurated in the production processes, have been most fruitful and sound almost like fairy tales. Obviously, for strategic reasons, many of them have not been announced or publicized.

It is obvious that we must reduce the costs of production and provide for a low cost, widespread distribution of products if we are to overcome successfully the heavy handicap of colossal war debt and meet other compelling obligations that will face us in the post-war era. The railroads will have a large part to play in the reconstruction period and, let us hope, in the future life of the nation. They have demonstrated their ability and capacity to handle mass transportation under unusual handicaps and undoubtedly have learned many lessons that can be applied to advantage after the war. They will continue to be the backbone of transportation in the days to come, despite the predictions of a considerable number of enthusiasts for other types of transportation.

That the railroads are awake to the seriousness of the problems that will confront them and to the necessity for planning well and carefully to meet competition in various forms, is indicated by the comprehensive plan of research that has been set up by the Association of American Railroads, under the direction of Vice-President R. V. Fletcher, and by the excellent research programs that are being quietly followed out by a number of the individual railway systems. One thing is certain as the picture gradually unfolds with the progress of these various research groups, and that is, that the railroads cannot be accused of being asleep at the switch, but are doing their level best to fit their programs into the post-war program, which, if our country is to continue to progress, must lick the problem of unemployment and insure a wider distribution of our products and services.

One of the best recent statements of railroad research is that made by E. C. Nickerson, assistant manager, sales and service, New York, New Haven & Hartford, in the Railway Age of September 11. The set-up of the New York Central Research Council was described in the Railway Age of July 10 by R. E. Dougherty, vice-president, improvements and developments, of that system.

Oil Transport

Early in September Director Eastman, of the ODT, pointed out that "we are approaching a time when our rail, water and pipe line facilities and equipment will be adequate to transport all the petroleum products which may be expected to become available for movement." The spectacular record made by the railroads in handling tank cars and the completion of the "Big Inch" pipe line, together with other measures, finally did the job. "Even now," said Mr. Eastman, "supplies are not always at hand at some important shipping points to keep these facilities operating at full capacity." This does not mean, however, that the railroads can let down on their efforts. Mr. Eastman, in closing, sounded this warning, "It is still imperative that there be no relaxation of efforts to eliminate all unnecessary tank car detentions, to move tank cars—both loads and empties—as rapidly as possible, and use all our petroleum transport facilities with the utmost efficiency."

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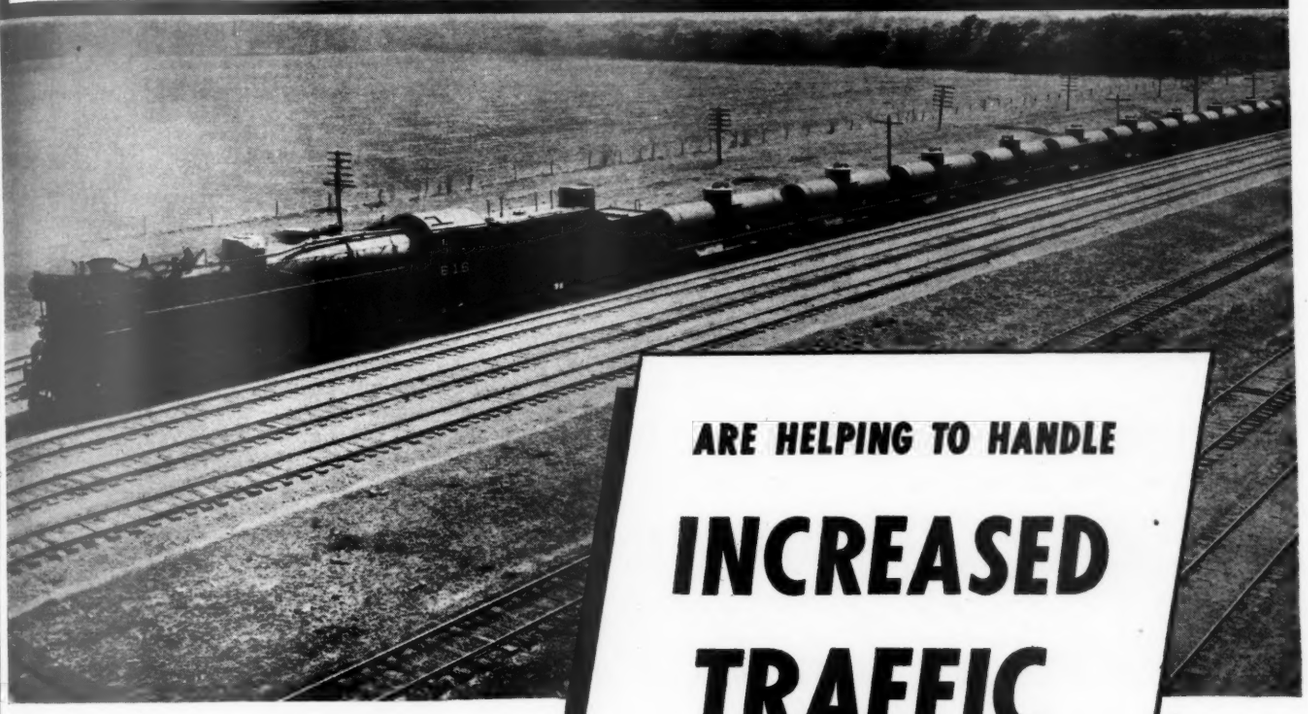
LIMA LOCOMOTIVES



ARE HELPING TO HANDLE

INCREASED TRAFFIC

THE Texas and Pacific Ry. Co. serves an area of prime importance in the war effort. » » In 1942 the revenue freight handled was 60.12% over 1941 and ton miles were up 35.58%. » » Thanks to a progressive motive power policy there were available to handle this tremendous load a group of modern Lima-built locomotives that contributed substantially in moving the increased tonnage.

LIMA LOCOMOTIVE WORKS — LIMA LOCOMOTIVE WORKS INCORPORATED — INCORPORATED, LIMA, OHIO

NEWS

Adjusting Safety Goggles

A SHORT sound motion picture film entitled "Right on the Nose" has been produced for the American Optical Co., Southbridge, Mass., and is available for loan or purchase through the company. It shows in detail the quickest, easiest methods of adjusting non-prescription industrial safety goggles and is intended to help eliminate the tendency of workers to discard improperly fitted goggles because they are uncomfortable to wear. The film demonstrates graphically that properly fitted goggles are light, cool and comfortable to wear and points out the relatively simple steps required to adjust goggles to faces of different sizes and shapes.

A companion booklet of the same title has also been issued.

A. A. R. Mechanical Division

LETTER BALLOT RESULT

THE General committee of the A. A. R. Mechanical division authorized the submission of recommendations from the Committee on Tank Cars to the letter ballot, these recommendations covering revised definitions and designating letters for Class T tank cars, as described in circular letter D. V.-1050 dated August 14, 1943. All of the propositions contained in the letter ballot have been carried by a large majority and include the revision of definitions TA, TG, TL, TM, TMU, TP, TW, also revisions of Note No. 1 and of the supplementary table. The following definitions are eliminated, TGB, TMM and TR. The recommendations of the Committee on Tank Cars regarding revised definitions and designating letters have been approved by the A. A. R. effective immediately.

SUBSTITUTION OF ONE-WEAR STEEL WHEELS SHOWN BY STENCIL

Under date of September 9, the A. A. R. Mechanical division has sent a circular letter to members and private tank car owners referring to the application of one-wear wrought-steel wheels (preferably new) in replacement of defective cast-iron wheels, without penalty, irrespective of owners or handling line defects, the car owners being billed for the betterment in accordance with the allowances shown in the interchange rules.

The letter states that questions have been raised with respect to the omission of stenciling to protect substitution of one-wear wrought-steel wheels in such cases and that, to clarify the intent, the following note has been added to first paragraph under Sec. D of the letters listing car owners who have authorized the railroads to substitute steel wheels: Note.—When one-wear wrought-steel wheels are substituted for cast-iron wheels, proper stenciling to protect the application must be applied to the car, for which a charge of ½ hour may be made. Such stenciling should be applied on the tank heads at both ends of car and read "1-W WRT. STL. WHLS. R&LI" (or whatever location or locations are involved).

GEARED HAND BRAKES

Following the adoption of Specifications for Geared Hand Brakes by A. A. R. Mechanical Division letter ballot last year, the various manufacturers of geared hand brakes were invited to submit their brakes for test and make application for certificate of approval. The secretary's office announces that, as of August 14, applications have been received, satisfactory tests conducted and certificates of approval awarded by the Committee on Geared Hand Brakes to the following manufacturers: Ajax Hand Brake Company, Type Designation Drawing 14038; Champion Brake Corporation, Drawing 1148; Champion Brake Corporation, Drawing 1124; W. H. Miner, Inc., Pattern D-3290-X; Superior Hand Brake Company, Drawing 566.

BRAKE BEAM—TRUSS ROD NUTS

The drawing illustrating the No. 15 A. A. R. Standard Brake Beam appearing on page E-83-Oct. 1, 1942, of the A. A. R. Manual of Standard and Recommended Practice, provides for the use of a 1¼-in. standard hexagon nut, seven threads per inch. Due to necessity for conservation of materials and difficulty being encountered in obtaining A. A. R. Standard cold-pressed truss-rod nuts, the use of Engineering

(*Continued on next left-hand page*)

Orders and Inquiries for New Equipment Placed Since the Closing of the September Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Loco.	Builder
Carnegie-Illinois Steel Co.	23[1]	Diesel-elec. and steam	H. K. Porter Co.
Chicago & North Western	11[10]	1,000-hp. Diesel-elec.	American Loco. Co.
	7[10]	600-hp. Diesel-elec.	American Loco. Co.
	2[10]	1,000-hp. Diesel-elec. road switch.	American Loco. Co.

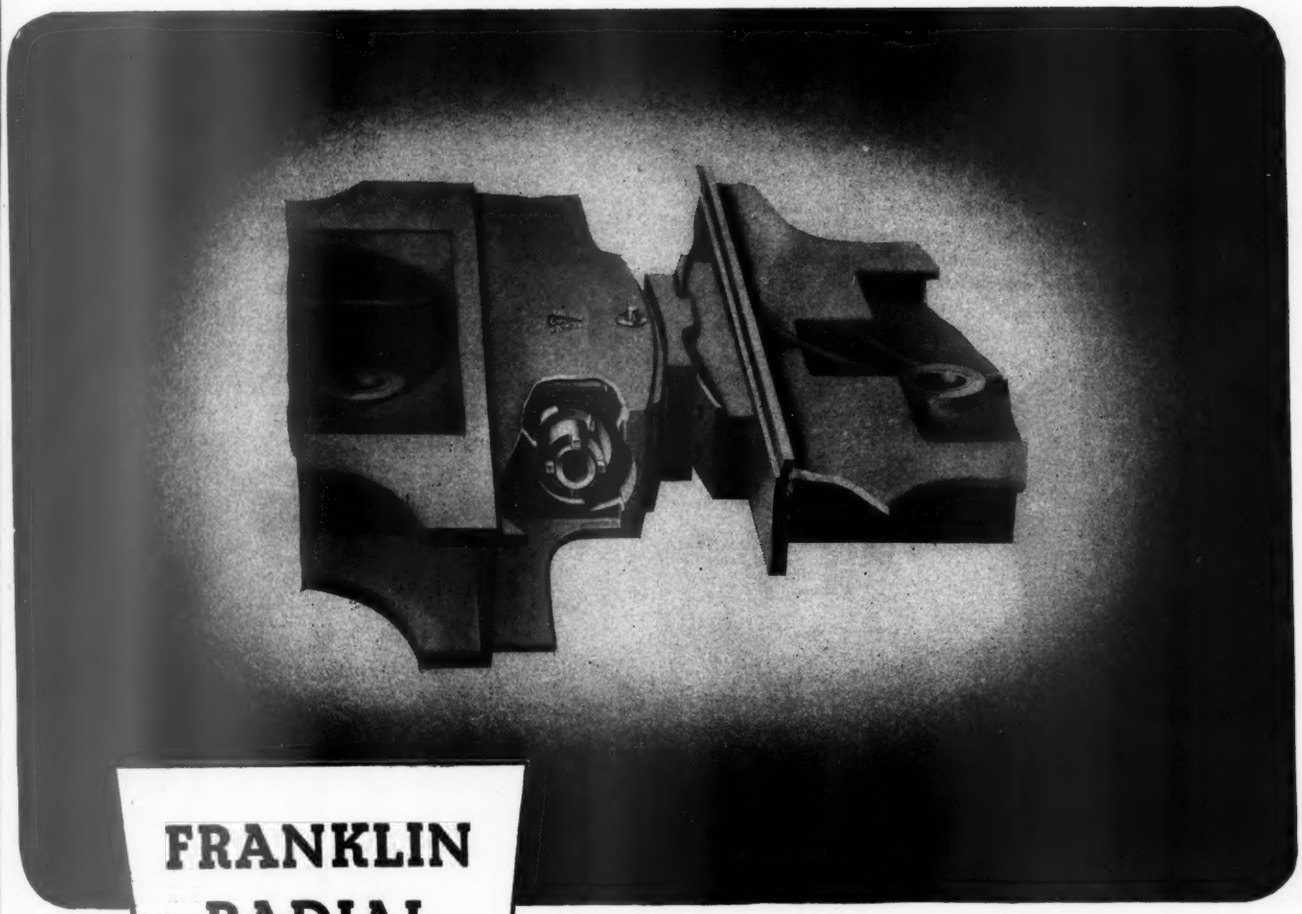
FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Car	Builder
Atchison, Topeka & Santa Fe	200[3,4]	Flat	Pullman-Std.
Alton	250[2,4]	Gondolas	Gen. Amer. Trans.
	500	50-ton box	Pullman-Std.
	250[3]	50-ton hopper	American Car & Fdry.
Ann Arbor	25[3]	Box	Wabash shops
Central of Georgia	165[4]	50-ton flat	Greenville Steel Car
Chesapeake & Ohio	125	50-ton drop-end gondola	American Car & Fdry.
Chicago & North Western	100[4]	50-ton flat	Ralston Steel Car
	500[5]	70-ton ore	Bethlehem Steel
Chicago, Milwaukee, St. Paul & Pacific	250[5]	Flat	Pullman-Std.
	300[5]	50-ton auto box	Company shops
	100[6]	Hopper	Company shops
Chicago, Burlington & Quincy	400[9]	Hopper	Company shops
Illinois Central	500-600	50-ton gondola	Company shops
Indiana Harbor Belt	425[7]	Box	Despatch shops
Midland Valley	75[8]	Gondola	Mt. Vernon Car
New Jersey, Indiana & Illinois	50[4]	Box	Wabash shops
New York, Chicago & St. Louis	300[2]	50-ton box	Gen. Amer. Trans. Cp.
	200[2]	50-ton box	Pullman-Std.
	500[2]	50-ton hopper	American Car & Fdry.
	25	70-ton hopper	American Car & Fdry.
	50[2]	70-ton drop-end gondola	Greenville Steel Car
Pere Marquette	100[2]	70-ton drop-end gondola	Greenville Steel Car
	100[2]	70-ton flat	Greenville Steel Car
	25	70-ton covered hopper	American Car & Fdry.
Wabash	350[3,4]	Box	Company shops
	175[2,4]	Gondola	Company shops

FREIGHT-CAR INQUIRIES

Road	No. of Cars	Type of Car	Builder
Baltimore & Ohio	1,000-2,000	50-ton hopper	
Central of New Jersey	1,000	70-ton gondola	
	500	50-ton hopper	
	100	70-ton flat	
Seaboard Air Line	200	50-ton box	
	200	70-ton hopper	
Southern Pacific	500	50-ton gondola	

[1] Including six Diesel-electric and six steam locomotives of the 60- and 35-ton classes.
[2] Composite design.
[3] In addition to 500 hopper cars already on order with A. C. F.
[4] Authorized by WPB.
[5] Authorized by District Court at Chicago.
[6] In addition to 400 hopper cars already under construction. Authorized by WPB.
[7] Authorized by WPB. In addition to 575 box cars already on order with Despatch shops.
[8] Subject to WPB approval.
[9] Authorized by WPB. The 400 cars to be of composite wood and steel construction, are in addition to 600 already on order in company shops.
[10] Authorized by District Court at Chicago. In the event that the War Production Board allocates any or all of the locomotives to manufacturers other than the American Locomotive Company, the railroad was authorized to acquire the engines from the manufacturers designated.



FRANKLIN RADIAL BUFFER *steadies the ride*

Even the utmost attention to locomotive design details cannot prevent a certain amount of surging and nosing with consequent vibration and swaying. The use of the Franklin Radial Buffer, Type E-2, to connect engine and tender, prevents these forces from being transmitted to the tender and the rest of the train. In turn, the great mass of the tender serves as a steadying agent on the locomotive. By effectually dampening the movements of the locomotive a far smoother, safer ride is obtained.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.
NEW YORK • CHICAGO
In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

Standard hot pressed nuts as an alternate in making repairs to brake beams for use in interchange has been approved as an emergency measure for the duration.

H. E. McCandless Simmons-Boardman Vice-President

HERBERT E. MCCANDLESS, assistant to the president in charge of circulation of the Simmons-Boardman Publishing Corporation, has been elected a vice-president of the company. Mr. McCandless was born in New York City on January 18, 1890. He began his career in 1905 in the banking field

Herbert E. McCandless

in New York City and from 1911 to 1917 was with a New York public utility company. From September 10, 1917, until 1919 he served in the U. S. Army, receiving a sergeant's rating on December 1, 1917, and serving with the A.E.F. as dispatch carrier. Since 1920 he has been with Simmons-Boardman. In 1928 he became assistant to the president in charge of circulation.

Freight-Car Authorizations

SINCE the publication on September 1 of the new freight car releases by the War Production Board which are shown in the accompanying table, additional freight cars have been authorized for construction as part of the WPB domestic car-building program for the last six months of this year. With the new releases, the program as of the week ended September 18 totaled 17,596 cars, allocated among 32 railroads. Of the 17,596 cars, 6,942 were authorized for building in the railroads' own shops and 10,654 in contract car builders' plants. Included are 5,774 box cars, 10,070 hopper cars, 737 gondola cars, and 1,015 flat cars. No further details of the freight-car authorizations since September 1 are available.

As a result of these additional releases, the backlog of cars then on order without WPB authority to build barely exceeded 10,000, most of which were on order with the contract builders, and there has been an appreciable increase in the number of inquiries coming into the market. The total backlog of cars on order as of the week ended September 18, numbers about 40,000, including about 10,000 remaining to be delivered under the WPB's program for the first six months of the year, on which deliveries have lately been accelerated.

New Freight Car Releases by War Production Board as of September 1, 1943

Allocated for Fourth Quarter, 1943

Name of Railroad	No.	Type	Builder
Alton	750	Hopper	American Car & Foundry
	500	Box	Pullman-Standard
Atchison, Topeka & Santa Fe	400	Box	Pullman-Standard
	200	Flat	Pullman-Standard
Ann Arbor	25	Box	Wabash R. R. Shops
	25	Hopper	Wabash R. R. Shops
Baltimore & Ohio	150	Hopper	Bethlehem Steel
Central of Georgia	150	Box	Pullman-Standard
Chesapeake & Ohio	620	Hopper	American Car & Foundry
	100	Flat	Ralston Steel Car
Chicago & Northwestern	250	Flat	Pullman-Standard
Chicago, Burlington & Quincy	1,000	Hopper	Company Shops
Chicago & Great Western	100	Flat	Pullman-Standard
Chicago, Milwaukee, St. Paul & Pacific	200	Box	Company Shops
	500	Hopper	Company Shops
Clinchfield	300	Hopper	American Car & Foundry
Denver & Rio Grande Western	50	Gondola	Pressed Steel Car
Illinois Central	600	Hopper	Company Shops
Lehigh Valley	250	Gondola	Bethlehem Steel Car
	600	Hopper	Bethlehem Steel Car
Midland Valley	25	Hopper	American Car & Foundry
Missouri Pacific	550	Hopper	American Car & Foundry
New Jersey, Indiana & Illinois	50	Box	Wabash R. R. Shops
New York Central	1,000	Box[1]	Despatch Shops
New York, Chicago & St. Louis	200	Box	Pullman-Standard
Norfolk & Western	500	Hopper	Bethlehem Steel Car
	500	Hopper	Virginia Bridge
Reading	800	Hopper	Company Shops
St. Louis Southwestern	250	Box	Company Shops
St. Louis San Francisco	100	Box	Company Shops
Virginian	1,000	Hopper	Company Shops
Wabash	350	Box	Company Shops
	175	Gondola	Company Shops
Total	12,270		

Allocated for Third Quarter, 1943

Atchison, Topeka & Santa Fe	600	Box	General American
	200	Gondola	General American
	200	Hopper	General American
Atlantic Coast Line	150	Hopper	Bethlehem Steel Car
Atlanta & West Point and Western & Alabama	125	Box	Pullman-Standard
Baltimore & Ohio	350	Hopper	Bethlehem Steel Car
Birmingham Southern	100	Box	Pullman-Standard
Central of Georgia	100	Box	American Car & Foundry
	165	Flat	Greenville Steel Car
Chicago & Northwestern	502	Box	American Car & Foundry
	417	Box	Pullman-Standard
Chicago & Illinois Midland	62	Gondola	Matner Stock Car
Chicago, Burlington & Quincy	330	Box	Company Shops
Chicago, Milwaukee, St. Paul & Pacific	300	Box	Company Shops
Clinchfield	200	Hopper	American Car & Foundry
Denver & Rio Grande Western	200	Flat	Mount Vernon Car
Georgia	100	Box	Pullman Standard
Louisville & Nashville	350	Hopper	Pullman-Standard
Missouri Pacific	600	Hopper	American Car & Foundry
Pittsburg & Shawmut	100	Hopper	General American
Reading	200	Hopper	Company Shops
St. Louis Southwestern	150	Box	Company Shops
Fruit Growers' Express	300	Refrigerator	Company Shops
Total	5,801		

[1]For Indiana Harbor Belt

Applied Electronics

AT a demonstration of electronic devices for industrial application, held at the Schenectady plant of the General Electric Company, September 14, 1943, L. A. Umansky, assistant manager, Industrial Engineering Division, suggested caution in the use of such devices, as follows: "Nothing but harm will accrue to engineering progress, and more specifically to the electronic art, if electronics is used without discrimination just because it is relatively new and, therefore, fashionable." Following this note of caution, Mr. Umansky and five of his associates proceeded to outline the status and potentialities of applied electronics.

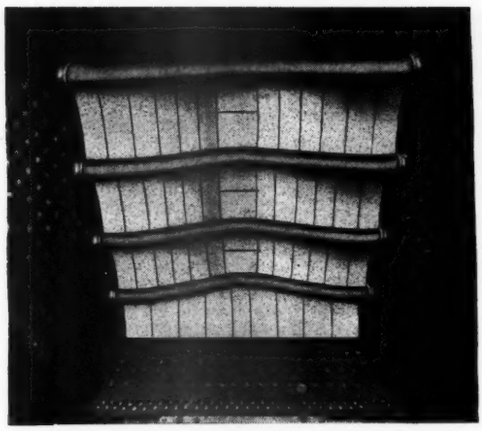
The magnitude of present applications is illustrated by the fact that in 1943 about 10 per cent of all electrical energy generated in the United States by any source of power will pass through electronic devices. A large part of this is the power required for electrochemical and light metal industries.

Examples given of railroad applications included rectifiers, varying in size from those supplying traction power on electrified railroads to those used for charging signal and control batteries. All electric arc welding falls within the definition of electronics. Amplifiers similar to those used in radio receivers find wide application in signaling service and, in fact, for increasing the current values induced in nearly all electronic detecting and control devices. The accurate control of resistance

(*Continued on next left-hand page*)

Miscellaneous Publications

CARBON BRUSHES.—NEMA has published a second edition of the Carbon, Graphite and Metal-Graphite Brush Standards, Publication No. 43-85, superseding the one issued in 1934. The pamphlet, consisting of 16 pages bound and well illustrated, is devoted to standard dimensions and tolerances for carbon, graphite and metal-graphite brushes, and standards for associated parts of brushes such as shunt cables, clips, and connections. An entire section is devoted to definitions for brushes, thus promoting uniformity in the language used for referring to these parts. Copies may be obtained from the National Electrical Manufacturers Association, 155 East Forty-fourth street, New York, at 25 cents per copy.



TAKE THIS STEP FOR COAL CONSERVATION

Coal on the tender represents not only certain dollars of expense but priceless man hours as well. Therefore, its careful conservation is a wartime duty « « A generation of railroad men have learned that Security Sectional Arches are easy on the coal pile. A complete arch in every locomotive firebox is a fundamental step towards fuel conservation.

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists

AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.
Locomotive Combustion Specialists

welding currents is another application. Through electronics, both resistance and arc welding now can be applied to light metals such as aluminum and magnesium. Fine and almost instantaneous control of motor speeds over wide ranges may be effected by electronic control. Very accurate control of furnace temperatures and other forms of heating is also made possible.

Among the newer applications are frequency converters which connect two a. c. power sources of different frequency through a d. c. intermediate circuit. This is done without the need of heavy rotating machinery. Other new applications include what might be called an extension of the human senses, since the devices can be made to respond accurately to light, sound, touch and temperature. Thus, actual values of vibration, sound, light and temperature, can be measured numerically. Minute changes in speed, such as a change from 1,800 to 1,800.1 r.p.m. can be detected. Actual speeds up to 300,000 r.p.m. can be measured. Induction heating is being applied effectively to accurate surface hardening of metal parts and also to the heating of non-conductors as, for example, the assembly of laminated plywood sections with synthetic resins. In the latter case, the time of heating has in many instances been reduced to less than 10 per cent of the time formerly required in steam ovens.

Many practical and successful applications of circuit control were described and demonstrated, and a guide for determining the value of such applications was offered by E. H. Alexander, engineer, Industrial Control Division, General Electric Company, as follows: "It is doubtful if electronic devices will ever approach the lower cost of contactors and relays for a given current rating. If the contactor, relay or rheostat will do the job well enough, it is not sound engineering to propose the electronic way; but if the magnetic way cannot do the job quickly enough, if it wears out too quickly, or if the open arc is objectionable, the electronic way may justify its extra cost."

Action on Manpower Demanded by Eastman

WARNING that "the United States is headed for a crisis in railroad manpower unless drastic remedies are undertaken immediately," Director Joseph B. Eastman of the Office of Defense Transportation during the week ended September 11 promulgated a "must" program of 13 points, including a threat to call for mandatory Interstate Commerce Commission orders suspending state full-crew laws and train and engine service mileage limitations. The suggested opportunities for relief, Mr. Eastman asserted, "must be pursued at once, no matter how foreign they may be to past customs and practices."

The program calls for action "by management and labor with the assistance of the government." Copies were thus sent to the Association of American Railroads, the American Short Line Railroad Association, the Railway Labor Executives' Association, the chief executive of each individual railroad, the head of each railroad labor organization, and to each government agency whose help may be needed. Mr. Eastman plans to call conferences where joint action is necessary, but he felt that much of the program could be put into immediate effect by individual roads.

The program's 13 points are as follows:

1. Prepare and file replacement schedules with Selective Service authorities so as to provide for the retention in railroad employment as long as possible of essential employees subject to Selective Service for whom replacements are not readily available and also to provide for the orderly withdrawal of railroad employees subject to Selective Service.
2. Organize and conduct a special railroad employee recruiting drive on an aggressive basis with the help of all available federal agencies.
3. Recruit and enlist services of women employees to the fullest possible extent.
4. Establish special regional pools of train, engine, yard, shopcraft, and other skilled employees under auspices of regional managers designated, respectively, by the Eastern, Southern, and Western railroads, and make special assignments from such pools wherever manpower emergencies develop in the regions concerned.
5. Secure full complements from war manpower authorities, for each railroad requiring unskilled labor, of (a) Mexican workers, (b) prisoners of war.
6. Without further delay make adjustments in existing working conditions wherever necessary to permit payment of time and one-half after eight hours for maintenance-of-way work.
7. Inaugurate immediate steps in cooperation with appropriate federal agencies to improve housing, eating, and commissary facilities wherever such facilities are now inadequate.
8. Expand immediately training programs with provision for payment of trainees during their training period.
9. Establish immediately effective plans for reporting current personnel shortages by occupation.
10. Establish labor-management cooperative committees to improve service and conserve manpower.
11. Establish means of assuring railroads high labor priority in areas of critical labor shortage.
12. The suspension for the duration, in certain circumstances, of the operation of so-called full crew laws.
13. The suspension for the duration, in certain circumstances, of train- and engine-service mileage limitations still in effect which result in under utilization of train- and engine-service employees.

The suggestion for cooperative labor-management action to improve service and conserve manpower (No. 10) is spelled out as a call upon management to go in for regular local, divisional and system joint conferences with labor representatives. "Representatives of railroad labor, particularly in train and engine service," the statement says, "have indicated their desire that such a program be developed. Thus far management has not manifested the necessary interest."

The program's detailed discussion of the first point (that calling for the preparation of replacement schedules) explains that the replacement schedule constitutes a list of those employees eligible for induction, together with what is, in effect, an agreement between the railroad and the Selective Service System as to which and how many employees may be inducted and the dates after which these inductions may be made.

ODT now stands ready to recommend to the Bureau of Selective Service of the War Manpower Commission a 60-day moratorium, on the induction of railroad workers in essential occupations "to be granted each railroad notifying appropriate State Selective Service Directors and the Office of Defense Transportation of its intention to prepare and file replacement schedules." Such a moratorium, if granted, "will be allowed for the sole purpose of completing and filing replacement schedules within the 60-day period stipulated. It will mean a stay of action on the induction of railroad employees in essential jobs during the moratorium period, but it does not mean blanket deferment."

The discussion of the fifth point, which relates to the employment of women, cites the Pennsylvania and Southern Pacific as having done relatively more than other roads in recruiting women employees. It then adds: "Not even the few companies that have been aggressive in this matter have by any means exhausted the possibilities." Meanwhile, the railroad labor organizations, with "no uniform policy," have "both helped and hindered." It is suggested that labor "should help consistently by agreeing, for the duration, to the modification of the seniority provisions of their labor agreements which militate against the employment of women."

The closing statement in the outline of the program says that if the suggested measures prove insufficient to meet the situation, "the only recourse will be further legislation by Congress," and ODT "will do what it can to promote such legislation." Meanwhile, Mr. Eastman, in the letter of transmittal, had expressed his belief "that the responsible officials of the railroads and of railroad labor organizations have the energy and capacity to meet the manpower problems of the railroads"; and he pledged "the full assistance" of the ODT.

Arthur G. Tartas

ARTHUR G. TARTAS, head of the Simmons-Boardman Publishing Corporation, editorial drafting department, which has served the *Railway Mechanical Engineer* since December, 1911, died on August 22. Mr. Tartas had served the Railway Age and its predecessors in this capacity for the past 54 years.

Born in England on March 21, 1869, Mr. Tartas was graduated from Clayton College, London, England. He was for two years draftsman and clerk of works in an architect's office, coming to this country in 1889 and becoming editorial draftsman for the Railroad Gazette (since incorporated in the Railway Age). He was appointed chief draftsman in 1892. That was back in the days of wood engravings—and the art of reproducing large drawings for publication within the limited compass of the printed page was in its infancy.

Mr. Tartas contributed in no small measure to the advancement of this technique—so necessary to effective technical journalism. Its peculiar and difficult problem is that of selecting the really essential characteristics of a large working drawing, combining them into a smaller reproduction—which conveys the necessary information to the informed reader, while eliminating the multitude of details which, in an engraving small enough for publication, would become a confusing smudge.

The present standards of technical drawings in the Railway Age, the *Railway Mechanical Engineer* and other Simmons-Boardman publications have largely resulted from the long efforts of Arthur Tartas in this important specialized field.

Supply Trade Notes

INTERNATIONAL NICKEL COMPANY.—*T. H. Wickenden,* assistant manager, has been appointed manager of the development and research division of the International Nickel Company to succeed the late *Albion James Wadhams. H. J. French,* who is temporarily serving in the steel division of the War Production Board in Washington, D. C., and has been in charge of alloy-steel development in International Nickel's development and research division at New York since 1932, has been appointed assistant manager of the division.

◆

ERNEST H. WEIGMAN RAILWAY SUPPLY COMPANY.—*Ernest H. Weigman* has resigned as vice-president in charge of sales of the Grip Nut Company, Chicago, to establish the Ernest H. Weigman Railway Supply Company at 310 South Michigan avenue. He will represent the Grip Nut Company in Chicago and Central-West territories.

◆

SAFETY CAR HEATING & LIGHTING COMPANY.—*Charles W. T. Stuart,* southeastern district manager of the Safety Car Heating & Lighting Company, and Philadelphia, Pa., manager of the Vapor Car Heating Company, has been appointed assistant to the president of the Safety Car Heating & Lighting Co., with headquarters in New York. Mr. Stuart, who is a graduate of the Drexel Institute of Technology, began his business career with the Baldwin Locomotive Works in 1908. He was employed in the motive power department of the Pennsylvania from 1909 to 1924. He joined the Safety Car Heating & Lighting Co. in 1924 and served as a sales representative until 1933 when he

Charles W. T. Stuart

was appointed southeastern district manager for the company and Philadelphia manager of the Vapor Car Heating Company. Mr. Stuart is the author of the book "Car Lighting by Electricity" which was originally published as a series of articles in the "Railway Electrical Engineer" in 1921 and 1922.

LINCOLN ELECTRIC COMPANY.—*William J. Conley,* former chairman of the engineering department of the University of Rochester, has been appointed consulting engineer for the Lincoln Electric Company, Cleveland, Ohio.

◆

OKONITE COMPANY.—*J. W. Hackett* has rejoined the sales organization of the Okonite Company after a two-year period as associate engineer with the corps of engineers, War Department, and more recently with the production section military supplies, New York District. Prior to his work with the corps of engineers, Mr. Hackett was associated with Okonite for 15 years as a specialist in the sale of insulated wires and cables for railroads. During his earlier career, he was employed as an apprentice engineer with the Union Switch & Signal Co., as an engineer in the signal department of the New York Central, and with the Federal Signal Company, predecessor of the General Railway Signal Company. Mr. Hackett will be attached to the New York sales office of the Okonite Company where he will again specialize in sales engineering for the railroad department.

◆

TIMKEN ROLLER BEARING COMPANY.—*W. H. Richardson,* assistant general sales manager of the Timken Roller Bearing Company, has been appointed general manager of all activities of all divisions of the company in eleven western states bordering on the west coast and in the Orient. He will make his headquarters in San Francisco, Calif. Mr. Richardson joined the Timken Company in 1917, and served in various sales capacities until 1929 when he was appointed manager of the Timken Roller Bearing Service & Sales Co., and vice-president of the Timken Roller Bearing Company, Ltd., of Canada, in which capacities he handled the sale of bearings for replacement in the United States, Canada, Latin American countries and the Orient. He became assistant general sales manager in 1941.

◆

GENERAL ELECTRIC COMPANY.—*W. F. Rauber* has been appointed manager of sales of the General Electric Company's outdoor and station equipment section. After his graduation from Notre Dame University with a degree in electrical engineering, Mr. Rauber took the General Electric test course in 1923. He was assigned to the switchgear sales department in 1924, and became a switchgear specialist in the company's Cincinnati, Ohio, office in 1928. He moved to the Cleveland, Ohio, office in the same capacity in 1931 and to Philadelphia, Pa., in 1936. He subsequently was appointed general assistant in the power circuit breaker sales section, which position he held until his present appointment.

◆

ALLEGHENY LUDLUM STEEL CORPORATION.—*J. W. Burdick,* salesman for the Allegheny Ludlum Steel Corporation, has been appointed assistant district manager of the company's Springfield, Mass., office and *J. T. Purtell,* assistant manager of orders at the Watervliet, N. Y., plant, has been transferred to the Springfield district as a salesman.

◆

GUSTIN-BACON MANUFACTURING COMPANY.—*Albert L. Gustin, Jr.,* vice-president of the Gustin-Bacon Manufacturing Company, Kansas City, Mo., has been elected president to succeed Albert L. Gustin, Sr.,

Ken Newman

Albert L. Gustin, Jr.

deceased. Mr. Gustin, Jr., was born at Kansas City, Mo., on March 6, 1904, and was educated at Culver Military Academy, Lawrenceville Academy, Missouri University and Pennsylvania University, from which latter institution he was a graduate in 1927. He then entered the employ of the Missouri-Kansas-Texas as a machinist apprentice and later resigned to enter the service of his father's company. In 1930 he was elected vice-president.

◆

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.—*Ralph C. Stuart* has been appointed manager of the lamp division of the Westinghouse Electric & Manufacturing Co., with headquarters in Bloomfield, N. J. Mr. Stuart, who has been with the Westinghouse Electric & Manufacturing Company and the Canadian Westinghouse Company for 25 years, was

(*Continued on second left-hand page*)

Army-Navy E Awards

American Car and Foundry Co., Berwick, Pa. August 19.

Copperweld Steel Company, Glassport, Pa. August 24.

Handy & Harman, Bridgeport, Conn. August 21.

Silent Hoist Winch & Crane Co., Brooklyn, N. Y.


SPOTLIGHTING
DIESEL SERVICE
400
BALTIMORE AND OHIO
57
BALTIMORE & OHIO
GENERAL MOTORS
LOCOMOTIVES

B&O

LEADERSHIP..

LATE IN 1830, Peter Cooper's *Tom Thumb* became the first steam locomotive on the Baltimore and Ohio Railroad, leading the way to a new era in transportation. The horse was doomed . . . More than a century later (August, 1935), the B. & O. again took the lead by placing in service the first Diesel road locomotive on any American railroad. Today, it leads the East with 81 General Motors Diesel Locomotive Units totaling 102,600 horsepower in all classes of service — with more to come.

Available records of 63 Diesel units show well over 15 million miles operated with 94 percent average availability. What other type of motive power can match such outstanding performance?

★ **BACK THE ATTACK — BUY MORE WAR BONDS** ★

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS CORPORATION

LA GRANGE, ILLINOIS, U. S. A.

transferred to the Bloomfield headquarters plant of the division in January, 1941, from the West plant of the Canadian Westinghouse Company at Hamilton, Ont., where he had been manager from 1930 until 1941.

◆

REYNOLDS METAL COMPANY.—The Railway Supply division of the Reynolds Metal Company, Richmond, Va., has been organized, with headquarters at Chicago, to manufacture and sell lightweight metals, principally aluminum, and locomotive and car parts. *J. W. Burnett,* who retired as general superintendent of motive power and machinery of the Union Pacific in 1940, has been appointed manager of the division, and *W. A. Stevens,* formerly secretary to B. M. Vincent, congressman of the Second district of Kentucky, has been appointed assistant to the manager.

J. W. Burnett was born at McCook, Neb., on October 19, 1890, and entered railway service in 1909 with the Chicago, Burlington & Quincy at McCook. In 1912 he resigned to enter the employ of the Union Pacific as a machinist apprentice at Cheyenne, Wyo. In the following year he became foreman at Kearney, Neb.; in 1917, became foreman at Laramie, Wyo., and in 1921 master mechanic at Green River. In the following year he was transferred to Cheyenne. In August, 1928,

J. W. Burnett

he was appointed assistant superintendent of motive power and machinery at Omaha, Neb.; superintendent of motive power and machinery in December, 1928, and general superintendent of motive power and machinery in 1933. From 1936 to 1938 he served as chairman of the Mechanical Division of the Association of American Railroads.

AMERICAN LOCOMOTIVE COMPANY.—*Lawrence B. Jackson* has been appointed director of engineering, Diesel Division, of the American Locomotive Company. Mr. Jackson is a graduate of Stevens Institute of Technology. After service with the American Hawaiian S. S. Company as superintending engineer and with the Texas S. S. Company as plant engineer at the Bath, Maine, shipyard, and superintendent of Technical Division, Marine Department, he became associated with Fairbanks Morse & Company in 1925. In the latter organization he advanced from the position of engineer, marine applications, to the assignments of assistant chief engineer and chief engineer of the Diesel Division; manager, marine Diesel sales, in Chicago; manager, New England (sales) branch at Boston, and manager of engineering in 1936. Mr. Jackson has contributed to various technical journals on subjects relating to internal combustion engines, and is the inventor of an interlock hydraulic control for water gas manufacturing and an exhaust silencer. He is a member of the American Society of Mechanical Engineers, serving on the Power Code Test Committee; the Society of Automotive Engineers, and Society of Naval Architects and Marine Engineers. He is also a member of the Technical Committee of the American Bureau of Shipping.

L. B. Jackson

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H. K. PORTER COMPANY.—*F. B. Schwartz,* manager of the Minnesota Pneumatic & Electric Tool Co., Minneapolis, Minn., has been appointed special representative for the northwest for the complete line of products of the H. K. Porter Company, Pittsburgh, Pa. Mr. Schwartz was in the employ of the Chicago Pneumatic Tool Company from 1926 to 1935, and had been assistant manager at Chicago. He has been with the Minnesota Pneumatic & Electric Tool Co. since 1935.

◆

METALLIZING COMPANY OF AMERICA.—The Metallizing Company of America, with general offices at Chicago, has purchased a new building at 135 Cedar street, New York, in which headquarters for sales and service operations in the eastern area have been established. The building is a complete operating unit, with development and test laboratories, warehouse facilities, and general service departments. There is also a complete demonstration shop with a typical operating metallizing set-up. *V. A. Cook* continues in charge of eastern operations.

Obituary

JOHN T. LUSCOMBE, sales manager of the United States Metallic Packing Company, Philadelphia, Pa., died in Orlando, Fla., on September 13.

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ALBERT L. GUSTIN, SR., president of the Gustin-Bacon Manufacturing Company, Kansas City, Mo., died in that city on August 28 of a heart ailment. Mr. Gustin was born at Neponset, Ill., on June 29, 1875, and entered the railway supply business in 1898 under the name of Albert L. Gustin. He had been president of the present company since its incorporation in 1903.

Albert L. Gustin

Personal Mention

General

W. E. BARNES, general superintendent of motive power and car equipment of the Atlantic region of the Canadian National, at Moncton, N. B., has retired

A. R. CARSON, superintendent of shops of the Canadian National, has been appointed acting superintendent motive power and car equipment, with headquarters as before at Moncton, N. B.

ALAN BEARDSHAW, superintendent of motive power and car equipment of the Southern Ontario district of the Canadian National, with headquarters at Toronto, Ont., has been appointed general superintendent of motive power and car equipment of the Western region at Winnipeg. Man.

JOHN KYLE, general superintendent of motive power and car equipment of the Western Region of the Canadian National at Winnipeg, Man., has retired.

ERNEST WADSWORTH PEARSON, assistant chief draftsman (car) of the Canadian National, has been appointed mechanical engineer (car), at Montreal, Que.

G. S. GOODWIN, formerly mechanical engineer, Chicago, Rock Island & Pacific, retired from railway service on September 20. Mr. Goodwin attended public schools in Ithaca, N. Y., and was a graduate in mechanical engineering from Cornell University in 1899. He entered railway service as a special apprentice at the Milwaukee, Wis., shops of the Chicago, Milwaukee, St. Paul & Pacific and, after completing the shop work, was transferred to the drafting office. During this latter period he had charge of the Milwaukee dynamometer car, making numerous tests on the Milwaukee and neighboring lines which used the car. In May, 1904, Mr. Goodwin went with the Great Northern as leading locomotive draftsman and in January, 1906, resigned to enter the employ of the Chicago, Rock Island & Pacific as chief draftsman, a position which he held until 1910. Mr. Goodwin was appointed assistant mechanical engineer in 1910; mechanical engineer of locomotives in June, 1913; corporate engineer in October, 1918; mechanical engineer, locomotives and cars, in February, 1921, assistant to the general superintendent of motive power in May, 1927. Mr. Goodwin held this position for 11 years and then resumed the title of mechanical engineer until June, 1943, when he was appointed engineer of car construction. During this period of nearly 38 years, Mr. Goodwin has seen the wood freight and passenger cars give way to steel, and locomotives grow from 10 wheelers with a tractive force of just over 30,000 lb. to the present 4-8-4 type with tractive force approaching 100,000 lb. He has had to do with the design of all the motive power and rolling stock now in use on the Rock Island, including the 5,000 Class 4-8-4 locomotives which have given notably good results on that road from the point of view of adaptation to modern speed and power requirements. Mr. Goodwin has been active in the work of the A. A. R., Mechanical Division, having been a member of the Car Construction committee for over 20 years. He also served as chairman of the Tank Car Committee for a number of years, during which time the question of autogenous welding of tank car tanks was active. It was through the efforts of the Tank Car Committee that approval of the Interstate Commerce Commission was finally secured for such construction. Mr. Goodwin served as president of the Western Railway Club in 1919-20.

Moffett Studio

G. S. Goodwin

B. L. THOMPSON has been appointed mechanical inspector of the Canadian National, with headquarters at Montreal, Que.

H. M. MCINNES has been appointed assistant to the chief mechanical officer of the Pere Marquette, with headquarters at Detroit, Mich.

C. W. BROWN, JR., has been appointed engineer tests of the Western Maryland, with headquarters at Hagerstown, Md. The position of chief chemist, formerly held by Mr. Brown, has been abolished.

P. R. BROADLEY, chief marine engineer of the Central of New Jersey at Jersey City, N. J., has been appointed mechanical engineer, with headquarters at Elizabethport, N. J., succeeding G. W. Rink, who has resigned from that position.

R. R. SNEDDON, master mechanic of the New York Central at Jackson, Mich., has been appointed assistant to the superintendent of equipment at Detroit, Mich.

ARVID L. OLSON, who has been appointed assistant mechanical engineer of the Chicago, Rock Island & Pacific at Silvis, Ill., as announced in the July issue, was born on November 16, 1900, at Moline, Ill. He received a high school education and took extension courses, entering the service of the Rock Island on December 1, 1917, as a messenger. On July 1, 1918, he became a clerk in the pattern department at Silvis; on April 1, 1919, draftsman; on June 1, 1932, chief draftsman, and on June 1, 1943, assistant mechanical engineer.

JESSE H. DAVIS, chief engineer-electric traction, of the Baltimore & Ohio, with headquarters at Baltimore, Md., retired from railroad service on October 5. Mr. Davis was born on October 7, 1874, at Forest City, Ark., and was a graduate of the University of Arkansas with a B. E. E. degree in 1900. He entered railroad service in 1900 as an employee of the Choctaw, Oklahoma & Gulf (now Chicago, Rock Island & Pacific), serving as assistant engineer on survey and construction. On March 17, 1901, he went with the Pennsylvania as draftsman in the electrical department at Altoona, Pa., serving in that capacity until October, 1905, when he left to become assistant electrical engineer of the Baltimore & Ohio at Baltimore. On May 10, 1909, he was promoted to the position of electrical engineer, and on September 1, 1924, was appointed chief engineer-electric traction, continuing the duties he formerly handled and in addition becoming responsible for the design and installation of the electrified facilities of the Staten Island Lines. This work was completed in 1926, and shortly thereafter, the University of Arkansas conferred upon Mr. Davis the degree of Electrical Engineer, in recognition of a paper presented by him concerning that electrification project. Throughout his 38 years of service with the B. & O., Mr. Davis was actively engaged in the modernization and improvement projects of that road. He was largely responsible for the substitution of electric lighting facilities for outmoded oil and gas lighting on B. & O. passenger cars. He designed, constructed, and supervised operation and maintenance of all power-plant and allied facilities of the system. In July, 1929, he designed and tested a completely equipped air-conditioned railway passenger car, and supervised design for the Martha Washington, the air-conditioned dining car which made its initial trip on April 14, 1930. His achievements further included an automatic battery charging station at Locust Point, Baltimore, in 1941, and the fluorescent seat lighting arrangement in the waiting room of Union station, Washington, D. C. His research in electronics resulted in the discovery that radio waves could be used for insect extermination, a process which is now in operation in commercial plants. Mr. Davis served as chairman of the Committee on Transportation sponsored by the American Institute of Electrical Engineers under the direction of the American Standards Association. He is a life member of the American Institute of Electrical Engineers; a member of the Electrical Section, Engineering Division, of the Association of American Railroads; Electrical Section, Mechanical Division, A. A. R.; American Railway Engineering Association, and the American Transit Association.

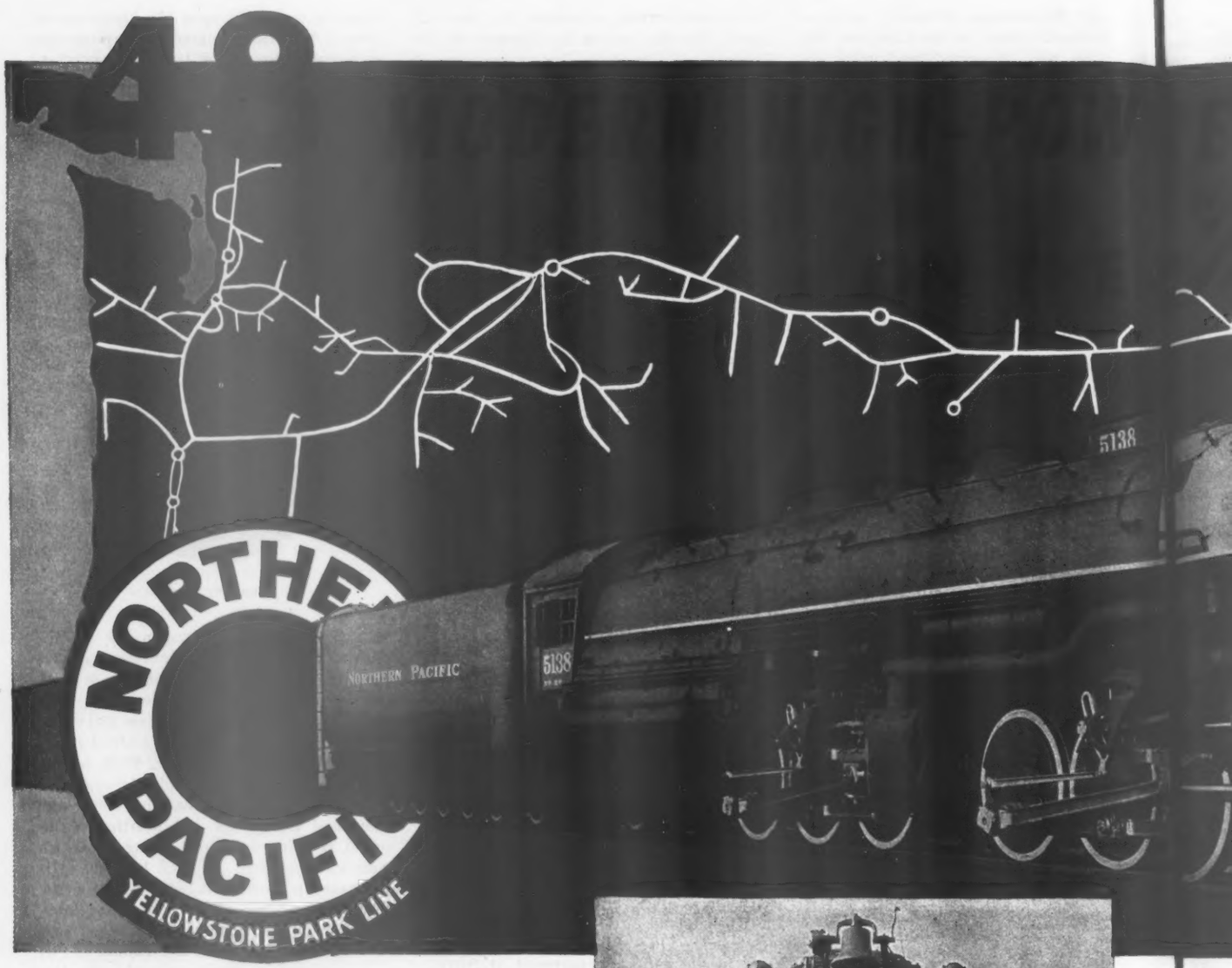
Jesse H. Davis

C. A. NICHOLSON, assistant to the superintendent of motive power of the St. Louis Southwestern, has been promoted to assistant superintendent of motive power, with headquarters as before at Pine Bluff, Ark.

Master Mechanics and Road Foremen

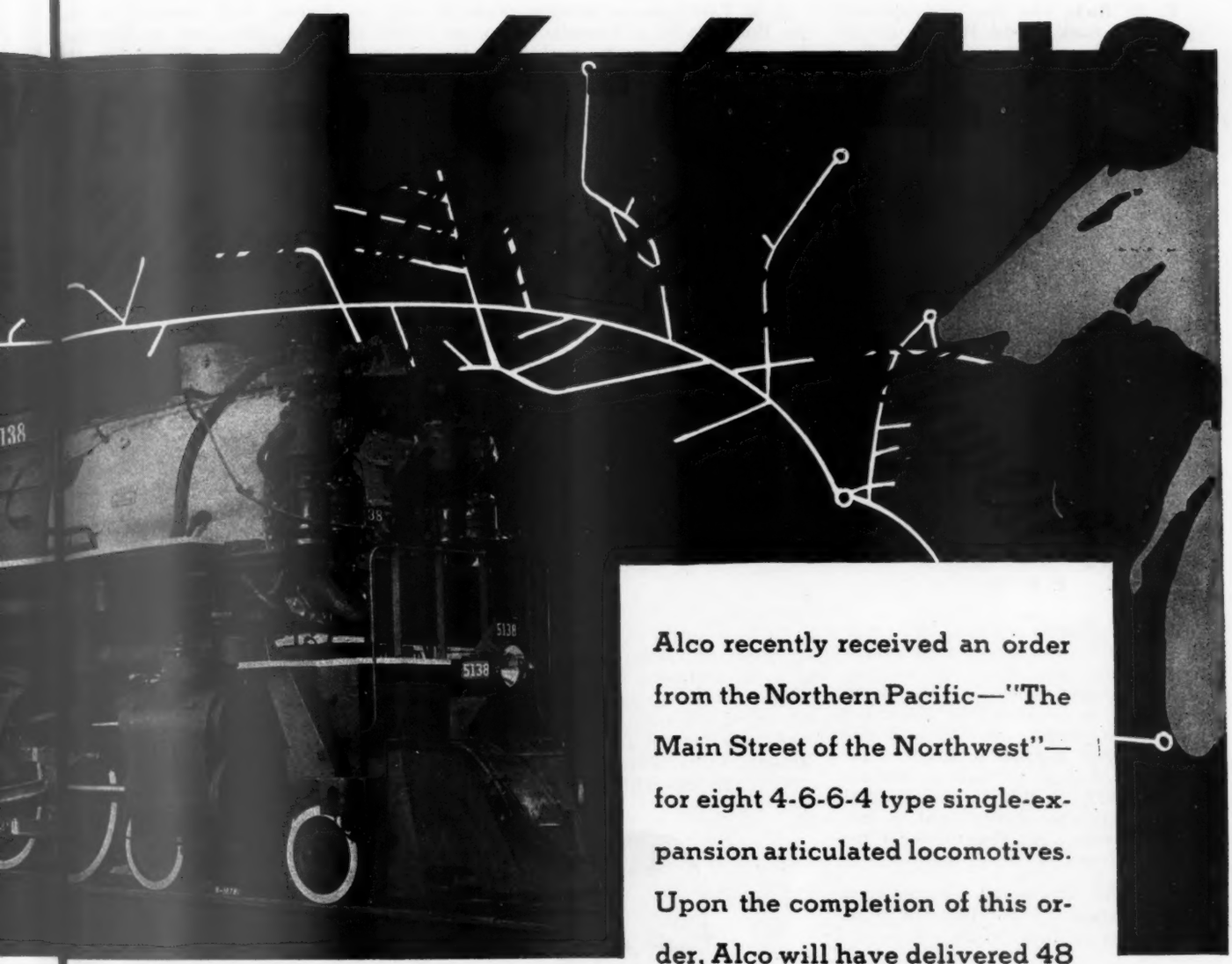
H. L. CRANE has been appointed assistant division master mechanic of the Union Pacific, with headquarters at Pocatello, Idaho.

(Turn to second left-hand page)



Locomotive Characteristics

Weight on Drivers	440,000 Lb.
Weight of Engine	644,000 Lb.
Cylinders (Four)	23 x 32 Ins.
Diameter of Drivers	70 Ins.
Boiler Pressure	260 Lb.
Tractive Power	106,900 Lb.
Tender Capacity—Fuel	27 Tons
Tender Capacity—Water	25,000 Gals.



Alco recently received an order from the Northern Pacific—"The Main Street of the Northwest"—for eight 4-6-6-4 type single-expansion articulated locomotives. Upon the completion of this order, Alco will have delivered 48 of these modern high-powered 4-6-6-4 type locomotives to this road—all delivered since 1936.

Alco

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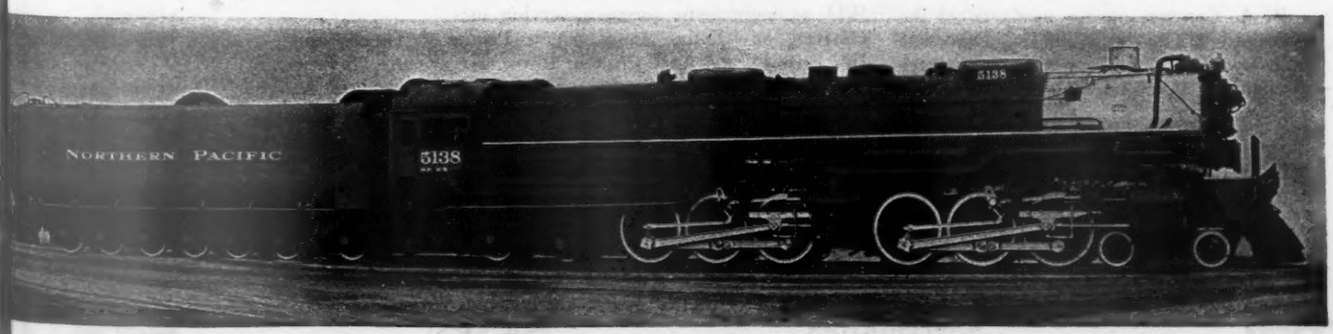

P. B. RICE, who has been appointed master mechanic of the Houston division of the Southern Pacific at Houston, Tex., as announced in the August issue, was born on April 9, 1901, at Ennis, Tex. He had

P. B. Rice

nine years' schooling at Ennis and a course on supervision with the Railway Educational Bureau from May, 1940, to May, 1942. He entered the service of the Southern Pacific on September 19, 1916, as a machinist apprentice. He became a machinist in 1921 and was promoted to the position of drop-pit foreman at Houston in April, 1922. In 1936 he was appointed general enginehouse foreman and on July 1, 1943, became master mechanic of the Houston division.

C. A. WILLINGHAM has been appointed master mechanic of the Interstate, with headquarters at Andover, Va.

ARTHUR LEO KNIGHT has been appointed road foreman of engines, Rivanna subdivision, of the Chesapeake & Ohio, with headquarters at Richmond, Va.

W. H. LONGWELL, master mechanic of the Baltimore & Ohio at Grafton, W. Va., has been transferred to the position of master mechanic at Cumberland, Md.

E. STIMSON, JR., master mechanic of the Baltimore & Ohio at Benwood, W. Va., has been transferred to the position of master mechanic at Grafton, W. Va.

W. E. BRAUTIGAM, assistant master mechanic of the Chicago, Milwaukee, St. Paul & Pacific at Deer Lodge, Mont., has been appointed master mechanic at Deer Lodge.

R. A. CONNER, master mechanic of the Baltimore & Ohio at Holloway, Ohio, has been transferred to the position of master mechanic at Benwood, W. Va.

J. L. BROSARD, master mechanic of the Chicago, Milwaukee, St. Paul & Pacific at Savanna, Ill., has been transferred to Chicago.

C. R. HEMING, assistant master mechanic of the New York Central at Niles, Mich., has been appointed master mechanic, with headquarters at Jackson, Mich.

E. M. TAPP, assistant master mechanic of the Union Pacific at Pocatello, Idaho, has been appointed to master mechanic of the Washington division, with headquarters at Spokane, Wash.

E. SEARS, master mechanic of the Chicago, Milwaukee, St. Paul & Pacific at Deer Lodge, Mont., retired on September 1.

H. A. ROLLWAGEN, general car foreman of the Chicago, Burlington & Quincy at Omaha, Neb., has been appointed to fill the newly created position of assistant master mechanic at Chicago.

Shop and Enginehouse

WINSBY WALKER, general foreman of motive power shops of the Canadian National at Montreal, Que., has been appointed superintendent of the system's shops, with headquarters at Moncton, N. B.

Obituary

HARRY P. ALLSTRAND, chief mechanical officer of the Chicago & North Western, with headquarters at Chicago, died suddenly at his home in that city on September 5. Mr. Allstrand was born at Council Bluffs, Iowa, on September 8, 1885, and was a graduate of Iowa State College in 1913. He entered railway service in 1903 as a machinist apprentice of the North Western at Missouri Valley, Iowa, and in 1907 was promoted to machinist and later to fore-

Harry P. Allstrand

man. In 1909, he left railway service to attend college at Ames, Iowa, returning to the North Western after graduation in 1913, as enginehouse foreman, serving successively at Clinton, Iowa, South Pekin, Ill., Proviso, and East Clinton, Iowa. Mr. Allstrand became division foreman at Chadron, Neb., in 1918, and in 1919 assistant master mechanic. He later served as master mechanic at Chadron and at Eagle Grove, Iowa, Belle Plaine and Boone. In 1924 he was appointed efficiency supervisor, with headquarters at Chicago; in 1926, assistant superintendent of motive power and machinery; in 1929, principal assistant superintendent of motive power and machinery, in August, 1939, assistant to the chief executive officer, and on December 1, 1941, chief mechanical officer. Mr. Allstrand was a past president of the Western Railway Club in Chicago.

GEORGE LAWSON, road foreman of engines of the Chesapeake & Ohio at Richmond, Va., died on July 8 at the age of 62. Mr. Lawson had been in railroad service for 39 years.

READING D. BULLUCK, who retired as master mechanic of the Atlantic Coast Line at Wilmington, N. C., on August 1, 1935, died on August 9, at Rocky Mount, N. C. Mr. Bullock was 78 years old.

T. F. SULLIVAN, master mechanic of the Texas & New Orleans, with headquarters at Ennis, Tex., died recently at his home in that city.

WALTER S. JAMES, electrical engineer of the Erie, with headquarters at Cleveland, Ohio, died recently at his home in Shaker Heights, Ohio.

FRED H. MEINCKE, supervisor of locomotive operation of the Delaware, Lackawanna & Western at Scranton, Pa., died on August 30 of injuries received at Wayland, N. Y., when a freight engine collided with the Lackawanna Limited, a D. L. & W. New York-to-Buffalo express, in the cab of which he had been riding when the accident occurred. Mr. Meincke was 55 years old.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

THREAD GRINDER.—Landis Machine Company, Waynesboro, Pa. Twelve-page bulletin E-93. Illustrates and describes the Landis No. 6 precision thread grinder.

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PIPE THREADING MACHINES.—The Oster Manufacturing Co., 2057 East Sixty-First street, Cleveland 3, Ohio. Four manuals: No. 300 Series—Pipe and Bolt Threading Machines; No. 422—Power Vise Stand; No. 502—"Pipe Master;" and No. 562—"Tom Thumb." The No. 300 Series are stationary machines; the other machines are portable. Each booklet divided into three sections—an operator's manual, a maintenance manual, and a spare parts list.

◆

GEAR-MOTORS.—General Electric Company, Schenectady, N. Y. Sixteen-page illustrated bulletin. Describes the many types of GE gear-motors, lists their advantages, and indicates the various locations where their use is most desirable. Contains also descriptions of the mechanical features of these motors, the electrical characteristics of the polyphase motors which are integrally built into them, and charts showing their horsepower-speed ratings.

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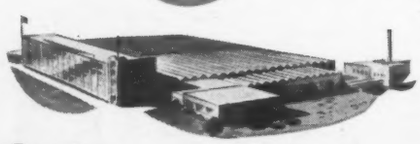

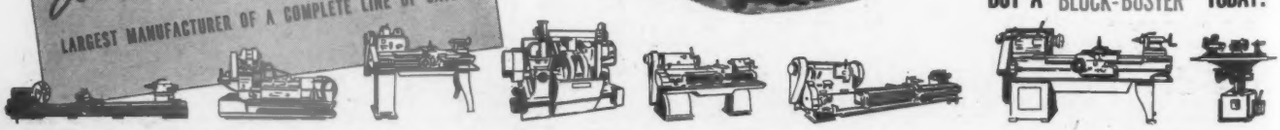

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